REPUBLIC OF GHANA

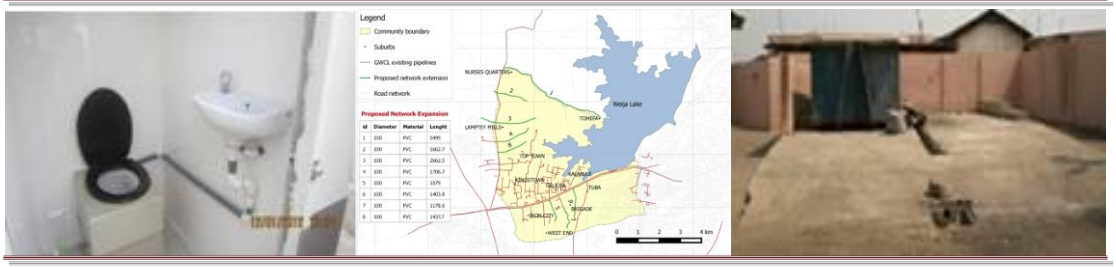
MINISTRY OF LOCAL GOVERNMENT AND RURAL DEVELOPMENT

GA SOUTH MUNICIPAL ASSEMBLY

GREATER ACCRA METROPOLITAN AREA (GAMA) SANITATION AND WATER PROJECT

CONSULTING SERVICES FOR COMMUNITY ENGAGEMENT/MOBILIZATION, DESIGN AND IMPLEMENTATION SUPERVISION FOR THE PROVISION OF IMPROVED SANITATION AND WATER SUPPLY IN NGLESHIE AMANFRO COMMUNITY – GA SOUTH MUNICIPAL ASSEMBLY

FINAL WASH INFRASTRUCTURE AND SERVICES OPTIONS REPORT



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ARAP	-	Abbreviated Resettlement Action Plan
BCC	-	Behavioral Change Communication
BGR-GSD	-	Bundesanstalt für Geowissenschaften und Rohstoffe and Ghana Survey Department
BOQ	-	Bill of Quantities
CAD	-	Computer Aided Design
CBO	-	Community-Based Organisations
CBT	-	Capacity Building Team
CL4D	-	Collaboration for Leadership Development
CSC	-	Community WASH Score Card
EHSD	-	Environmental Health and Sanitation Directorate
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EPA	-	Environmental Protection Agency
ESMF	-	Environmental and Social Management Framework
FOM-H	-	Facilities Operation and Maintenance Handbooks (FOM-H)
FOMP	-	Facility Operation and Management Plans
GAMA	-	Greater Accra Metropolitan Area
GASMA	-	Ga South Municipal Assembly
GIS	-	Geographic Information System
GSS	-	Ghana Statistical Service
GWCL	-	Ghana Water Company Limited
IA	-	Implementing Agencies
ITB	-	Invitation to Bid
KAPB	-	Knowledge, Attitudes, Practices and Behaviour
LGPCU	-	Local Government Policy Coordination Unit
LICSU	-	Low Income Community Support Unit
LIUC	-	Low-Income Urban Community
MA	-	Municipal Assembly
MLGRD	-	Ministry of Local Government and Rural Development
MMA	-	Metropolitan and Municipal Assemblies
MMDA	-	Metropolitan, Municipal and District Assemblies
NGO	-	Non-Governmental Organisations
NHPC	-	National Population and Housing Census
O&M	-	Operation and Maintenance
OBA	-	Output Based Aid
PCU	-	Project Coordinating Unit
PLWH/A	-	Persons Living With HIV/AIDS
PPP	-	Public-Private-Partnership
RAP	-	Resettlement Action Plan
R-B M&E	-	Results-Based Monitoring and Evaluation
RPF	-	Resettlement Policy Framework
RRI	-	Rapid Results Initiative
SIFT	-	Sanitation Improvement Facilitation Team
SWP	-	Sanitation and Water Project
TOR	-	Terms of Reference
UNICEF	-	United Nations Children's Fund
WASH	-	Water, Sanitation and Hygiene
WSUA	-	Water and Sanitation Users Association

EXECUTIVE SUMMARY

This document is the finalized version of the draft WASH facilities, services and financial options report for improving environmental sanitation and water supply services in Ngleshie Amanfro. This report incorporates feedback from the key stakeholders on the draft report. The recommended technical options and the related costs proposed in this document are based on outcome of literature reviews, assessment of baseline field data, physical assessments of WASH facilities, focus group discussions and community & stakeholder negotiations (see Appendix 7).

Design considerations made in the selection and recommendations of the technical options were based on technical feasibility, local knowledge on functionality and care of use, space demand/constraints, resilience, durability; costs (i.e. capital and operation & maintenance -O&M), ease of O&M, ease of construction with local materials and availability of skilled artisans, socio-cultural acceptance and inclusiveness; gender preferences; community involvement, feasibility of implementation, financial sustainability, environmental and social impact and benefits.

Based on the above, the following recommendations on WASH service and infrastructure improvement are made

A. <u>Household Sanitation Technology Options</u>

Taking into consideration the existing sanitation facilities and service situation in Ngleshie Amanfro, and recommended options listed in the National Environmental Sanitation Strategy Action Plan (NESSAP), a catalogue of sanitation technology options are proposed. The key advantages and disadvantages of the options are provided in Appendix 1 of this document. As part of assessment of the technology options, existing knowledge of community members on the proposed options were solicited (see Appendix 2 of this document).

A. Category 1: Individual household level sanitation technology options:

a) VIP
b) KVIP
c) Pour flush with septic tank
d) Pour flush with leach pit
e) WC/cistern flush with septic tank (single/double)
f) WC/cistern flush with leach pit (single/double)
g) Urine diversion toilet (UDT)
h) Biofil toilet
i) Biogas toilet
j) Van's biological toilet
k) Enviro loo/Ecosan waterless toilet
l) Ecosafe (Vulpec) toilet
m) Mulch toilet

In areas of high population and housing density, issues of tenancy and availability of space are very critical elements for installing facilities especially individual household (stand-alone) facilities. Options for shared-block facilities have therefore been proposed.

B. Category 2: Households shared-block sanitation technology options:

a) Shared-block VIP
b) Shared block KVIP
c) Shared block pour flush with shared septic tank
d) Shared block WC with shared septic tank

e) Shared block urine diversion toilet (UDT)
f) Shared block biofil toilet
g) Shared block Biogas toilet with shared digester
h) Shared block Van's biological toilet
i) Shared block enviro loo/Ecosan waterless toilet
j) Shared block Ecosafe (Vulpec) toilet
k) Shared block Mulch toilet

C. Communal network sanitation technology options:

a) WC/cistern/pour flush connected to simplified (condominium) sewer network linked to centralised/decentralised communal treatment system (e.g. centralised Janicki Omni processor /decentralised communal septic tank, bio-digester plant,)

Unit Costs for Proposed Individual Household Sanitation Options

Table ES1 below provides estimate unit costs for each of the proposed options.

Table ES1: Unit Cost for proposed individual household sanitation technologies

Facility Type	Estimated Unit Cost (USD)		Total Cost (USD)
	Sub-structure (digester) cost	Superstructure + sanitary fixtures cost	
VIP	302.05	130.19	432.24
KVIP	302.05	136.70	438.75
Pour flush with septic tank			1,725.00
Pour flush toilet connected to sewer	100	440.73	540.73
Water Closet (WC)/cistern flush toilet connected to sewer	100	490.85	590.85
Water Closet with septic tank	615.38	410.26	1,025.64
Pour flush with leach pit	252.95	620.77	873.72
Water closet with leach pit			1,550.00
Biofil standard digester	384.62	179.49	564.10
Biofil standard digester with sand	384.62	307.69	692.31
Biofil Microflush Standalone	384.62	641.03	1,025.64
Enviro loo toilet			630
Biogas toilet			1,435.00

Faecal Sludge Treatment Options

Faecal sludge collected from Ngleshie Amanfro is disposed directly into the sea at Lavender hill. Based on the faecal sludge (shit)-flow analysis (see Figure 2.5 of this document) list of applicable treatment options were assessed.

Based on the assessments, centralised bio-digester/reactor septage treatment plant (see Figure 3.4) is recommended. A biogas reactor or anaerobic digester is an anaerobic treatment technology that produces (a) a digested slurry (digestate) that can be used as a fertilizer and (b) biogas that can be used for energy. Biogas is a mix of methane, carbon dioxide and other trace gases which can be converted to heat for cooking or electricity (for lighting).

B. Household Latrine Promotion Models

Training of Sanitation Activists/Canvassers: in order to ensure that household latrine promotion improves in the community, a number of community activists/canvassers for home latrine promotion have been trained as part of the GAMA SWP. The activists/canvassers have been trained on the recommended sanitation technology options and are expected to share information and deepen community members' understanding of the project benefits.

Artisan Driven Model: this model aims at creating a sustainable artisanal delivery of household toilets with the artisan carrying out both marketing and construction of toilets for households. In this model the artisan procures the materials and carries out all the construction works. Previous experiences show that if the artisans' businesses are project-driven then the demand from households for artisans' services often decline at the end of the project. This model can be sustained if the artisan is self-motivated and engaged in a sanitation business which is demand-driven (see Figure ES 1 below).

The artisan driven model is enhanced by the extension of credits to households by microfinance institutions and other financial intermediaries for home improvement including acquisition of household toilets. Existing groups like the Artisans Association of Ghana with offices in Accra and Ashaiman, and community savings groups will be engaged in the promotion of home improvement. This has the potential of increasing the construction of toilets by households.

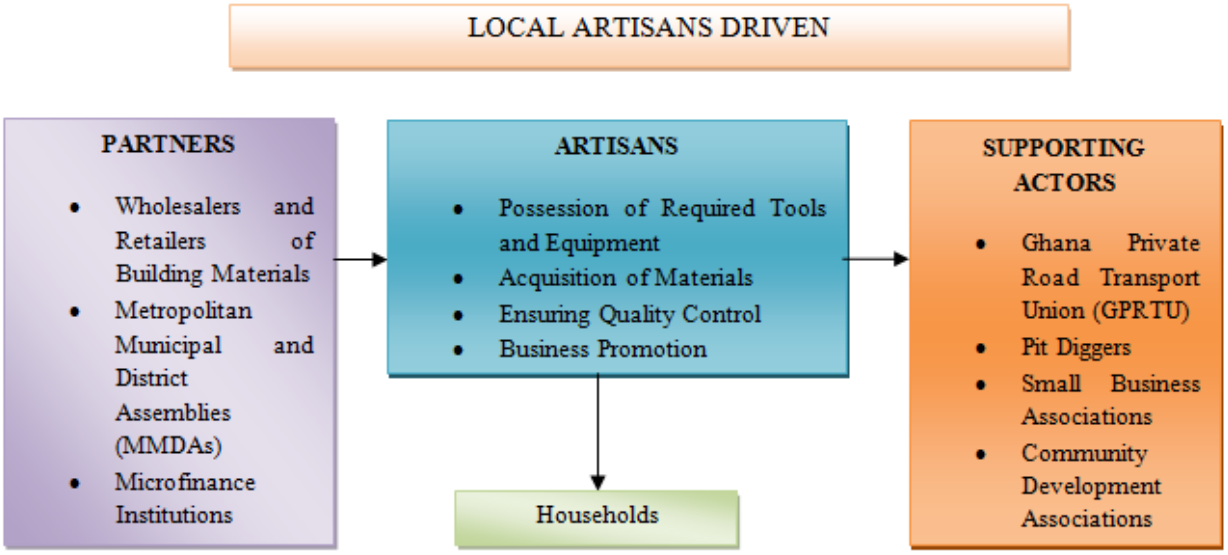


Figure ES1: Key actors and roles of the local artisan driven household latrine promotion model

Enterprise Solutions: this proposed model involves a network of registered enterprises that engage trained artisans and/or agents to promote market and /or construct approved household toilets. The artisans are paid direct labour costs for constructing a facility.

The trained agents are either paid-employees of the enterprises or are engaged on retainer basis often paid a percentage of the total cost of an installed facility. The operations of enterprises are not limited to the jurisdiction of any particular MA and may operate GAMA-wide.

The Ghana Federation of the Urban Poor Toilet Makers Company is an example of a registered Sanitation Enterprise operating at GAMA- wide level. Enterprises registered (or Licensed) by MAs may provide training to community members of the Sanitation Improvement Facilitation Team (SIFT) to promote the construction of household toilets in the community. The inclusion of various financial institutions (commercial banks and microfinance institutions) which advance credits to households to finance home improvements, including household toilets, has the potential for sustaining latrine promotion. The key features of the model are detailed in Table 3.8 of this document.

C. Water Supply Improvement

Water supply improvement in Ngleshie Amanfro entails extension of distribution lines from existing mains into sections of the community that have no water supply lines. The essence is to provide the needed support for household connection. The extension is estimated to cost **US $768,842.82**.

D. Solid Waste Management Upgrade

The following are the list of interventions proposed for improvement/upgrading of solid waste management at Ngleshie Amanfro

- Provision and supply of 571 240 litre (L) household waste storage bins
- Construction of 1no. tollbooth, 7.29m^2 floor area
- Construction of 3no. solid waste holding bays (SWHB), 105m^2 floor area
- Improvement of graveled access road to site, 260m road length
- Provision 950m of U450 and U600 access road side ditches and transfer station drains
- Construction of plastic buyback center equipment inclusive, 207m^2

The total cost for provision of the above improvement interventions is **US$ 409,620.00**

E. Sullage and Stormwater Disposal

It is proposed that all houses in the area should be provided with technical support to construct simple soakage pits usually located at the back of bathhouses to dispose of household sullage. Similarly simple uPVC pipes may be laid to connect to the simple soakage pits to discharge grey water from kitchens. Grease traps may be installed to separate solids from kitchen waste. The soakage pits will be sized to adequately handle the estimated amount of wastewater (including both bathroom sullage and grey water from kitchens).

The estimated cost of constructing soakage pits in 834 houses within the project area is **US$ 127,912.55**.

The community lacks an effective drainage system resulting in the frequent flooding incidences in most parts of the town. A detailed hydrological survey is therefore required to address drainage issue comprehensively. However, based on community demand/request, drainage interventions have been proposed in prioritized locations (as identified by residents) such as No Weapon, Darius, Brother Lee, Salma Palace, and Apegya Back. The estimated cost for drainage construction is **US$ 287,800.00.**

F. Total Cost of Interventions

Estimated cost of interventions – (Option 1- with 2No. 24-seater pour flush public toilet

S/No.	Project Intervention (GSMA)	Amount in US$
1	Promotion of household toilets	3,023,699.00
2	Construction of 2No. 24-seater pour flush public toilets at the Galilea and Manheami	72,116.24
3	Construction of sewer and appurtenance	7,124,958.75
4	Construction of centralised bio-digester sewage treatment plant	2,542,375.00
5	Extension of GWCL water supply distribution mains	768,842.82
6	Provision of standard 240L household waste storage bins	39,970.00
7	Provision of solid waste holding bay at Galilea market	369,650.00
8	Construction of household soakage pits	127,912.55
9	Construction of 1,439m of U600 drain for storm water conveyance	287,800.00
10	Sub-total	14,357,324.36
11	Add 10% of Subtotal as contingency	1,435,732.44
12	**Total Cost of Interventions (Option 1)**	**15,793,056.80**

Estimated cost of interventions – (Option 2- with 2No. 20-seater WC/Cistern flush public toilet

S/No.	Project Intervention (GSMA)	Amount in US$
1	Promotion of household toilets	3,023,699.00
2	Construction of 2No. 20-seater WC flush public toilets at the Galilea and Manheami	90,145.30
3	Construction of sewer and appurtenance	7,124,958.75
4	Construction of centralised bio-digester sewage treatment plant	2,542,375.00
5	Extension of GWCL water supply distribution mains	768,842.82
6	Provision of standard 240L household waste storage bins	39,970.00
7	Provision of solid waste holding bay at Galilea market	369,650.00
8	Construction of household soakage pits	127,912.55
9	Construction of 1,439m of U600 drain for storm water conveyance	287,800.00
10	Sub-total	14,375,353.42
11	Add 10% of Subtotal as contingency	1,437,535.34
12	**Total Cost of Interventions (Option 2)**	**15,812,888.76**

G. Financing Options

The proposed financing options for consideration by individual households include:

- Use of Own/Family/Friend Income
- Use of Free Materials and Labour
- Loans and Micro Credit
- Self Help/Savings Groups
- Micro Credit with Insurance System

H. Proposed Financing Mechanism – G-Fund Example

People's dialogue has set up G-Fund (a saving scheme) with Ghana Federation of the Urban Poor (GHAFUP). The G-Fund consists of the savings of the urban poor and some contributions received from third parties. The aim of the G-Fund is to provide the urban poor with micro financing for a broad variety of needs that the urban poor of GHAFUP select themselves. Due to the high cost of using WASH facilities, WASH hardware has been the need selected most. Loans have been provided to water vendors, public/private bath houses etc. from the G-Fund. The G-Fund currently amounts to 400,000 GHS (US$ 102,564) and the default rates below 10%. This level of default is made possible because the G fund is a Community Social Development Fund and GHAFUP employs a system of accounting principle that calculates default only on principal unlike other financial institutions where loans and defaults are calculated on Loan plus Interest amount.

Members of GHAFUP determine the interest levels, acceptable default rates and recoverable percentages. G Fund belongs to a global Community of funds operating within the Slum Dweller International (SDI) networks in over 34 countries that focuses not exclusively on Financial sustainability but equally on delivery of service to beneficiaries with tolerable recovery rates of seventy percent (70%) on the principal component of loans and hence extremely low default rates (10%) making it six (6) percentage lower than prevailing default rates of microfinance institutions in Ghana.

This experience by People's Dialogue shall be developed and used in Ngleshie Amanfro. The process involved in obtaining loan from G-Fund to finance WASH needs is described in Figure 7.1 of this document.

1. PROJECT BACKGROUND

1.1 Introduction

The Government of Ghana, acting through the Ministry of Local Government and Rural Development, is implementing the Greater Accra Metropolitan Area Sanitation and Water Project (GAMASWP) funded through a grant from the International Development Agency (IDA)/World Bank. The project seeks to increase access to improved sanitation and improved water supply in the Greater Accra Metropolitan Area (GAMA), targeting low income urban communities (LIUCs), and to strengthen management of environmental sanitation across GAMA.

An important component of this project is the upgrading of access to WASH services for a total of 250,000 people in LIUCs selected from the 11 Metropolitan and Municipal Assemblies (MMAs) in GAMA. For the purposes of this project, LIUCs have been defined as those in which at least 75% of households live in a single room, and at least 75% of households use public toilets or other unacceptable toilet facilities.

In the case of the Ga South Municipal Assembly (GSMA), Ngleshie Amanfro was selected as the LIUC by the Municipal Assembly (MA).

Project interventions will include:

- Partially subsidized sanitation facilities for compound housing meeting project criteria;
- Establishment of public toilets under sustainable Public Private Partnership (PPP) management arrangements, where compound level facilities are not possible;
- Technical assistance and facilitation of micro-finance for single households to build improved sanitation facilities;
- Development, if necessary, of fecal sludge management services so as to enable the servicing of all facilities in the selected community;
- Improved water supply arrangements;
- Implementation of a program to promote improved hygiene-related behavior;
- Where appropriate, development of sustainable improved local-level management of drainage systems;
- Improvement of local-level solid waste management in order to ensure effective drainage and reduce solid waste accumulation in latrine pits.
- An action learning initiative to generate empirical evidence on the gender dimensions, impacts and implications of sustainable urban sanitation for poor men and women, girls and boys. The action learning will assess and gather evidence on the gendered implications of the intervention regarding policy, financing, design, operation, maintenance, use and sustainability.

1.2 Objectives

The objectives of the assignment are to:

a. Support GSMA in engaging community members of Ngleshie Amanfro to establish a baseline of existing and end-line situations for sanitation, water supply, and hygiene conditions and practices, as well as socio-economic and demographic characteristics of the low income community;
b. Support the design and construction supervision of sanitation and environmental infrastructure to improve services in Ngleshie Amanfro;
c. Support the design implementation of hygiene promotion and behavioral change campaigns, including due consideration of gender aspects; and
d. Establish a simple, sustainable community-based monitoring and feedback system.

The above is to be achieved in close collaboration with the communities, local and central agencies concerned, and with the formal and informal private sector service providers where appropriate.

1.3 Scope of Services

The scope of services for the assignment includes:

a. Prepare a base map of the target community by defining the geographic area/mapping in consultation with the MA
b. Carry out a baseline study and inventory of water, sanitation and hygiene (WASH) infrastructure and services, habits, preferences, water and sanitation related health data/characteristics
c. Conduct gender informed needs and preference assessment to identify technically, socially, financially, and environmentally appropriate solutions
d. Recruit and train local community activists to support the work of a dedicated Sanitation Improvement Facilitation Team (SIFT)-comprise community members, Consultant and other relevant stakeholder and facilitate communication with the community, including hygiene promotion
e. Hold public consultations to validate the baseline assessment and discuss possible interventions and future management arrangements with clear roles for the community and all other stakeholders
f. Develop a list of feasible sanitation and water supply service options in discussion with MA, Capacity Building Team/Environmental Health and Sanitation Directorate (CBT/EHSD), Ghana Water Company Limited (GWCL), and project staff
g. Prepare designs for the sanitation infrastructure in accordance with appropriate local standards
h. Identify and negotiate preferred sanitation solutions with the community
i. Identify and agree on a body to represent the community
j. Prepare a budgeted plan for infrastructure investment and development of services and service providers (if relevant)

k. Mobilize resources, with the support of the CBT, submitting plans through the MA to the Local Government and Policy Coordination Unit (LGPCU), and in discussion with microfinance partners where household or compound level infrastructure (toilets, bathrooms, water connections) is involved
l. Assist the MA to select and supervise contractors for community infrastructure with the support of the CBT
m. Support the formative research on hygiene promotion, and the delivery of the resulting campaign messages, with the support of the CBT and the EHSD.
n. Establish community-based monitoring and feedback system for all the services provided under the project, and facilitate the production of the first three 6-monthly reports to the MMA, EHSD and GWCL.
o. Undertake an end line study, update the inventory of WASH infrastructure and services and create an updated community WASH scorecard

1.4 Expected Outputs

The expected outputs of the assignment include the following:

a. Community base maps
b. An inception report including an updated work programme and selection of communities for survey
c. WASH inventory, Gender Needs Assessment and community scorecard
d. WASH Service and Infrastructure Options
e. Environmental and Social Screening Report
f. Environmental Impact Assessment (EIA) scoping report (if EIA is required); Resettlement Action Plan (RAP) report (if required)
g. EIA, Environmental Management Plan (EMP) and RAP/ARAP reports (if required)
h. Detail Design, Tender Documents and Financing Plan
i. Design of a community-based monitoring and feedback system
j. Post Intervention WASH Inventory and Community Scorecard
k. 3 No. Bi-annual Monitoring Report
l. 11 No. Quarterly Monitoring Report
m. Final/Completion Report

1.5 Structure of Report

This report is the finalised version of the draft WASH infrastructure and service options report. It incorporates feedback received from the community and other key stakeholder engagements on the draft report. The report focuses on the recommended household and communal WASH infrastructure and service upgrade options for Ngleshie Amanfro in fulfilment of 'Output-d'. The report also indicates unit costs of the proposed household WASH interventions as well as preliminary estimates for bulk/communal interventions.

The report is structured as follows:

Executive Summary	This section summarises the key issues presented in this report.
Chapter One	***Introduction:*** This section presents the general project background information and expected deliverables.
Chapter Two	***Existing Sanitation and Water Situation in Ngleshie Amanfro:*** The existing environmental sanitation and water situation in Ngleshie Amanfro are discussed in this chapter. An abridged form of the detailed baseline report
Chapter Three	***Sanitation Facility and Service Improvement Options: proposes*** household, communal sanitation, faecal sludge collection, treatment and disposal options, service delivery models and costs.
Chapter Four	***Water Supply Improvement Options:*** presents options for improved water supply to the community.
Chapter Five	***Solid Waste Management Improvement Options:*** describes options for improved household and communal solid waste collection and disposal.
Chapter Six	***Sullage Disposal and Drainage Improvement Scheme*** presents options for conveyance and disposal of grey water and stormwater from households/premises
Chapter Seven	***Technical and Financing Options:*** this section describes the Implementation Packages, Cost involved, Proposed Financing Options and Adaptation of WASH Infrastructure Financing Mechanism - G-Fund
Chapter Eight	***Appendices:*** this section summarises the description of sanitation facilities, Cost estimates of proposed household sanitation options, Summary of technical and financial options for Ngleshie Amanfro Town, Knowledge of Community Members on Proposed Household Sanitation Technology Options Estimated cost of proposed simplified sewerage system, Advantages of HDPE pipes over other brands in the local market and Participant List and Pictures of Stakeholder Engagement Forum.

2. ENVIRONMENTAL, SANITATION AND WATER SUPPLY SITUATION

2.1 Community Profile

The Ngleshie Amanfro community is located in the Ga-South Municipal Assembly (GSMA) and has the N1 Highway/Accra-Cape Coast Road passing through it. The settlement has two electoral areas - Ngleshie Amanfro Electoral Area and Amanfro Galilea Electoral Area. Suburbs in the community include Iron City, Kalabule, Top Town, Zongo, Manheami, Galilea, America farm and Omai Kope. The community has an estimated population of 25,873 and an average household size of 4.96. [1]The total number of households is estimated at 5,291 with an average of 9 households per house. The population and housing densities are estimated at 6.6person/ha and 0.25houses/ha respectively.

Figures 2.1 presents the boundary map and location map (showing some suburbs) of the community respectively.

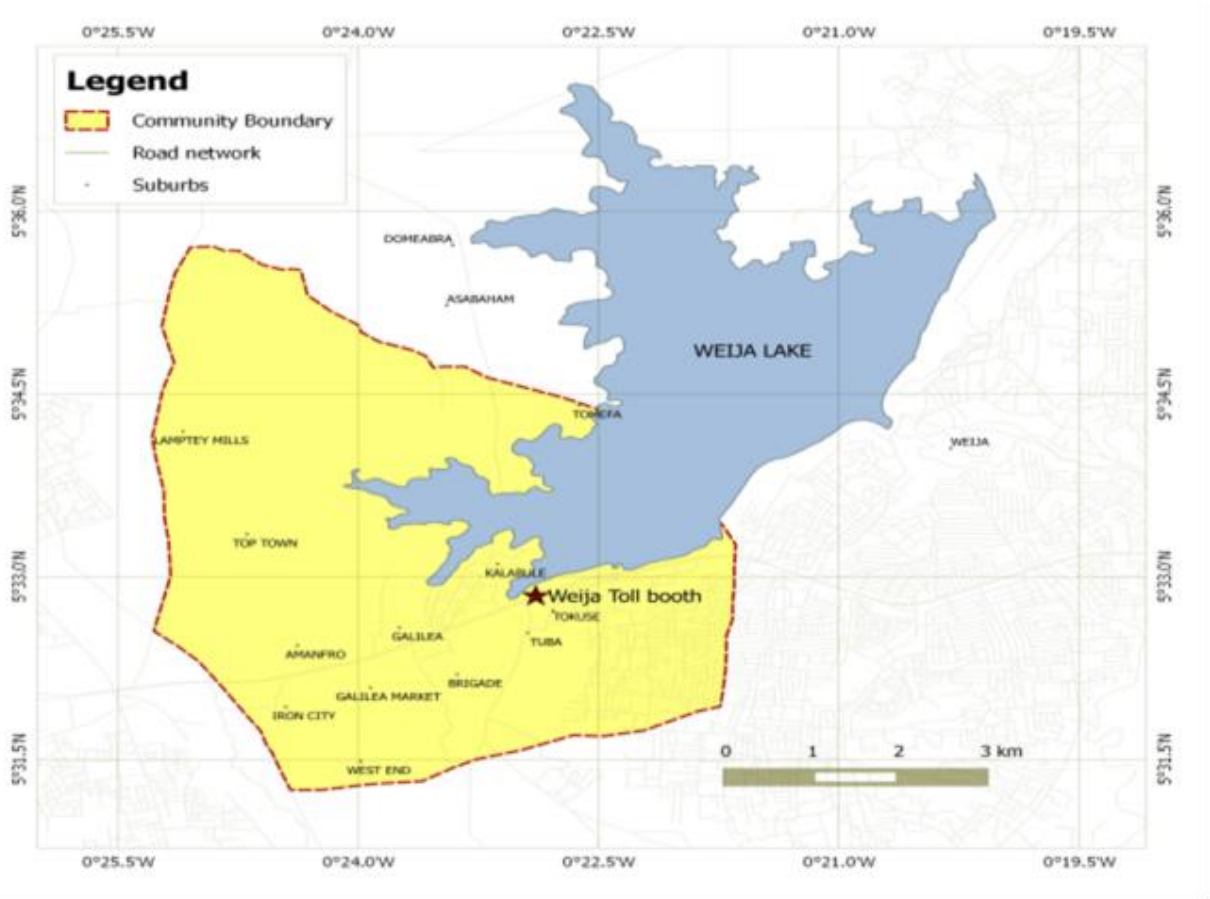


Figure 2.1: Location map of Ngleshie Amanfro

2.2 Sanitation Situation at Household Level

The existing situation on the availability and usage of household toilets in the study community are provided below.

[1] Based on 2015 community baseline survey

2.2.1 *Availability of In-House Toilet Facilities*

About 45% of the households do not have home (in-house) toilets. Households with at least five (5) toilets in-house constituted 1.53% while about 50% indicated having one or two toilets within the house (dwelling). Figure 2.2 below shows the number of toilets per house for the remaining 55% households that have toilet facilities in-house.

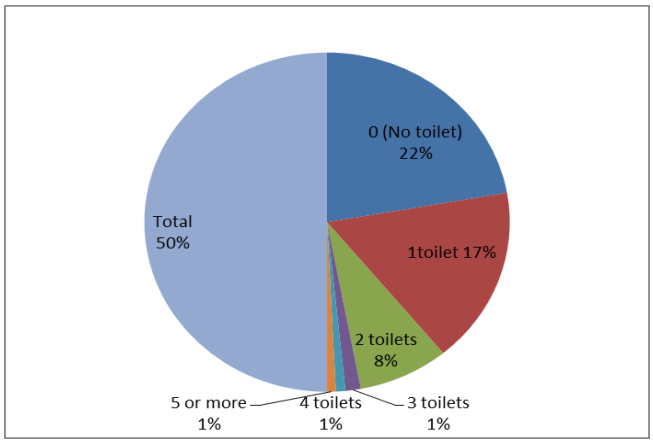


Figure 2.2: Distribution of Households by No. of Toilets in House

2.2.2 *Household Toilet Types*

Pit latrine with slab/VIP is the most common toilet facility type in the community (i.e. about 50.5% of household toilets are Pit latrine with slab/VIP). About 22% rely on WC flush to septic tank. Unimproved pit latrines account for 17.1% of the household toilets (see Figure 2.3 below).

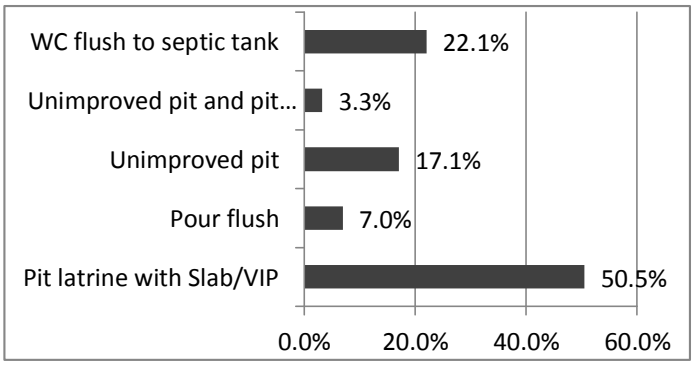


Figure 2.3: Household toilet facility types

Plate 2.1: Commonly used Pit latrine with Slab Facility in the Community

2.2.3 Household Toilet Ownership

About 24% of the households have toilets exclusively used by their members- Figure 2.4 below. About 19% of households who have dedicated households in house are found within compound house while about 30% are in detached houses and 33% are in semi-detached structures. Tables 2.1 and 2-3 give further details of household toilet ownership.

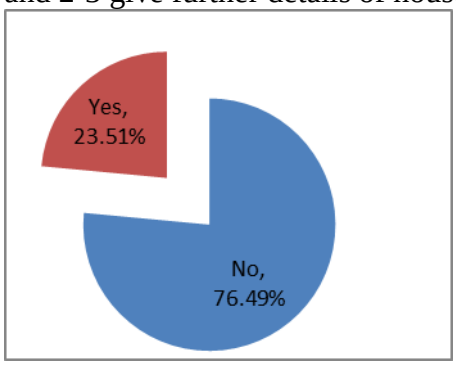


Figure 2.4: Households with dedicated toilets

Table 2.1: Households having their own dedicated toilets by house type

Type of House	Household Has Its Own Dedicated Toilet		
	No	Yes	Total
Compound house	81.48%	18.52%	100.00%
Detached	69.67%	30.33%	100.00%
Semi detached	66.95%	33.05%	100.00%
Temporary structure	90.27%	9.73%	100.00%

2.2.4 Public Toilet Usage

27% of the households use public toilets (either exclusively or in combination with other means of disposing of human excreta). Public toilet usage is more prevalent among occupants of temporary structures at 38.94% (see Table 2.2 below).

Table 2.2: Public toilet usage by house type

	Use of Public Toilet		
Type of House	**No**	**Yes**	**Total**
Compound house	70.81%	29.19%	100.00%
Detached	79.51%	20.49%	100.00%
Semi detached	74.48%	25.52%	100.00%
Temporary structure	61.06%	38.94%	100.00%

2.2.5 Physical Conditions of Shared Block/Public Toilets and O&M Procedures

Majority of the public toilets in the community are privately owned. The community currently has four (4) functional public toilet facilities owned by the MA two (2) of which are in deplorable states. Table 2.3 below presents the list of public toilets in Ngleshie Amanfro and some further details.

Table 2.3: List of public toilets in Ngleshie Amanfro

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Man-Hey/Manheami/Galilea New Town public toilet	• 16-seater KVIP • Ghana Water Company Limited (GWCL) supply available • Flow of water into taps is twice per week • Water can be tapped from 150mm pipeline along main road • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Toilet in a very dilapidated state • Walls of building have wide spread cracks/screeds on walls have peeled off • No doors • Cracks in squat slab • Toilet is filled up/ requires time for digestion and desludging • Possible site for new toilet falls into a road and school boundary • School authorities should be involved in final decision to make the land available for the toilet • Available space is (5X13)m^2 and (4X13)m^2 which is not adequate for new facility • No drainage facilities are available (both surface/subsurface) • Visible effects of erosion • Proper drainage system required to protect foundation of structures • High sulphate effects on foundation visible • 20 pesewas per visit
Galilea public toilet site No.1	• 10-seater aqua privy • Water flows twice in a day • GWCL main line runs 30m along the existing road • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Normal overburden • Adjoining area is old refuse dump • Land slopes from south to north • No drains available • Drainage facilities require to contain surface runoff • Site fencing required to prevent encroachment • Can be rehabilitated or upgraded to pour flush • Additional 10-seater water closet toilet with septic tank with improved site sanitation conditions • 200 persons/day • 30 pesewas per visit
Manheami public toilet	• 12-seater aqua privy • Private owned facility commercialized for public use • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• 30 pesewas per visit • 60 persons per day

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Galilea public toilet site No.2	• 10-seater aqua privy • Water flows twice in a day • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Normal overburden • Roof is in bad condition • Land slopes from south to north • No drains available • Drainage facilities require to contain surface runoff • Site fencing required to prevent encroachment • Can be rehabilitated or upgraded to pour flush • Additional 10-seater water closet toilet with septic tank with improved site sanitation conditions • 200 persons/day • 30 pesewas per visit
Galilea Market public toilet	• 26-seater pour flush toilet in a sound structural state • No water connection to the site • Site depend on tanker service for site water delivery • Ground mounted storage tank (Rambo 1000 and sintex SCT 250 litres) • GWCL waterline runs along the market road about 50m from the site. • GWCL water can easily be tapped to the site • The best option is water from GWCL line. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Entire area unpaved, very unsightly site • Site slopes from west to east • Entire toilet site has to be paved • Require an interceptor drain at frontage area and south fence area • The site is accessible; there is an access road from the Kasoa highway to the site
Amanfro-Ayigbe Town public toilet	• There are two number 24-seater water closet toilets which are in good condition • Sulphate effect is causing plastering and paints on the external walls peel off • External walls need cladding • There is an old 24-seater toilet in a very deplorable structural state. Facility has to be demolished to create space for additional facilities • Two ground tanks have been constructed at the site. Both are served by tanker service tanks • GWCL line connection has been made available to the facilities. However, high bills have discouraged their patronage	• Generally the site looks clean • Sweeping and cleaning arrangements regarding rubbish are satisfactory • The toilet site is accessible • The site is fenced but not gated. The east and south sides are entirely fenced. There is the need to complete fence at the north or front side and the east side • Half of the compound is paved but erosion has destroyed it. The defect is aggravated by improper compaction. This needs to be rectified. The remaining section unpaved has to be paved. Defective section has to be scarified/removed, gravelling topped up, compacted and repaved • One skip container available. Container is fully filled indicating that collection frequency is not satisfactory • Additional skip container will improve the situation. Skip pads are

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
	• Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	required
Angleshie-Amanfro public toilet site	• 20-seater toilet is a perfect structure • Septic tank needs to be resized • The abandoned 24-seater toilet facility should be demolished to create space for future developments • GWCL water line close to the site about 5m away offer water supply into the ground tank facility at the site • An existing overhead tank mounted on the roof level. Water is pumped from a mechanized borehole on site. Very low groundwater flow has rendered that system redundant • Water is taken from the groundwater and used for flushing • The new toilet is essentially operating as a pour flush toilet • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Site is weedy indicating an unkempt site and poor management condition • Septic tank for the newly constructed 20-seater gets full very often • 2 months desludge period reported. Poor sizing (size is too small, (2.9X4.5)m^2 and/or very high water table may be the possible causes • Site is accessible • Entire site is unpaved. Effect of erosion is visible towards the sloping sides. Entire compound must be paved • There is an old 24-seater toilet facility at the site which is not in used at the moment • 20-seater toilet is a perfect structure • Septic tank needs to be resized • The abandoned 24-seater toilet facility should be demolished to create space for future developments • No skip container available at the site • GSMA must assist in providing skip containers and skip pads
Amanfro Zongo public toilet site	• The site has one 20-seater water closet toilet which is in a perfect standard condition • Sulphate attack on external walls has started. Cladding of external wall areas will help to curb the situation. External wall areas need to be treated before cladding. • An entirely new septic tank is required. This tank has to be well sized to suit the toilet. • Evenly segregated for both male and female • A mechanized borehole linked to 1 Rambo 1000 and Rambo 500 polytank provides water for toilet management • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Site is weedy and unsightly. Poor site management • An uncompleted septic tank is used for effluent management. Serious health hazard and danger to users. Top slap/cover of septic tank has not been constructed. GSMA must immediately take steps to ensure completion of septic tank before allowing users to use the toilet • The site is accessible • Site is entirely fenced. Fencing is satisfactory. Plastering of fence wall required. • Site is partially paved. Paving completion is required to improve site drainage condition. • There are no drains to control site runoff and compound erosion. • Site slopes from west to east • No drainage facility at the site • Site drains are required at east and south sides of the site. The east side drain is the outfall drain. A soakage pit outfall is required. • No skip container available at the site • GSMA must assist in providing skip containers and skip pads

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Peter Ocansey's toilet facility (Ngleshie Amanfro zongo (House No.:M36/A)	• 12-seater VIP latrine with 4 bathrooms attached • Facility is privately owned • Owner of facility buys water from tanker trucks to clean facility • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Site has foul smell • Pit unclean • Space is inadequate for expansion but facility can be improved to pour flush or water closet • No drainage facility available • Anal cleansing materials are burnt on site • 40 pesewas per visit • Acquires a revenue of GHC 25.00
Torkosu toilet facility (House No. 310)	• Privately owned 2-seater VIP latrine • Fairly new facility • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• No space is available for expansion. • Can be improved to aqua privy • 40 pesewas per visit
Togbuyaka's toilet facility	• Privately owned 8-seater VIP latrine • GWCL water flows within the premises • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Space within facility is limited • There is no space for refuse management • 40 pesewas per visit
Doris Atsitsovi's toilet facility	• 4-seater VIP latrine • Fairly new • GWCL water flows within the premises • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • The toilet has no hand washing facilities • Toilet had no facilities for physically challenged persons • The toilet has no hand washing facility	• Septic tank under construction • Space available for any additional improvement • Neat surroundings of facility • 40 pesewas per visit
Etseshilavu's toilet facility	• 2 seater VIP latrine • Evenly segregated for both male and female • 3 bathroom in addition to latrine • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• There is space available for expansion and improvement • Poor drainage around facility • 40 pesewas per visit
David Ankrah's toilet facility	• 4-seater VIP latrine • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Space available for expansion and improvement • 40 pesewas per visit

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Cecilia Fiamor's toilet facility	• 12-seater VIP latrine • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Structure made up of wood • Dilapidated facility • Needs demolition • Anal cleansing material burnt
Tomefa community	• 80% of houses in Tomefa have a pit latrine constructed by Ga-South Municipal Assembly (GSMA). Out of these pit latrines, about 70% of the latrines are full. As a result of this, open defecation is rampant in the community. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• No open drain available hence erosion is evident in the community • Bathrooms do not have soakage pits hence grey water is not handled properly. • No refuse skip is available hence, indiscriminate dumping of refuse is prevalent in the community • Bright Vision International Academy which is the only basic school in Tomefa has no toilet facility available therefore pupils rely on proprietor's toilet. • No source of drinking water.

2.2.6 Faecal Sludge Generation and Management Practices

The flow of faecal sludge from the point of generation to the final destination for Ngleshie Amanfro is presented in Figure 2.5 below. Table 2.4 gives the volume of faecal sludge produced in a day.

Table 2.4: Volume of faecal sludge in a day

Per Capita Faecal Sludge Generation		**Population**	**Estimated Volume of faecal sludge (L/day)**	**Percentage (%) of faecal sludge**
WC/flush	1.0L/cap/day	5,323	53,23.45	25.41
Unimproved Pit latrine & VIP	0.2L/cap/day	795	158.98	0.76
Unimproved pit	0.2L/cap/day	4,119	823.81	3.93
Pour flush	0.2L/cap/day	1,686	337.23	1.61
VIP	1.0L/cap/day	12,164	12,164	58.06
Open defecation	1.2L/cap/day	1,785	2,142.28	10.23
Total		**25,873**	**20,950.19**	**100.00**

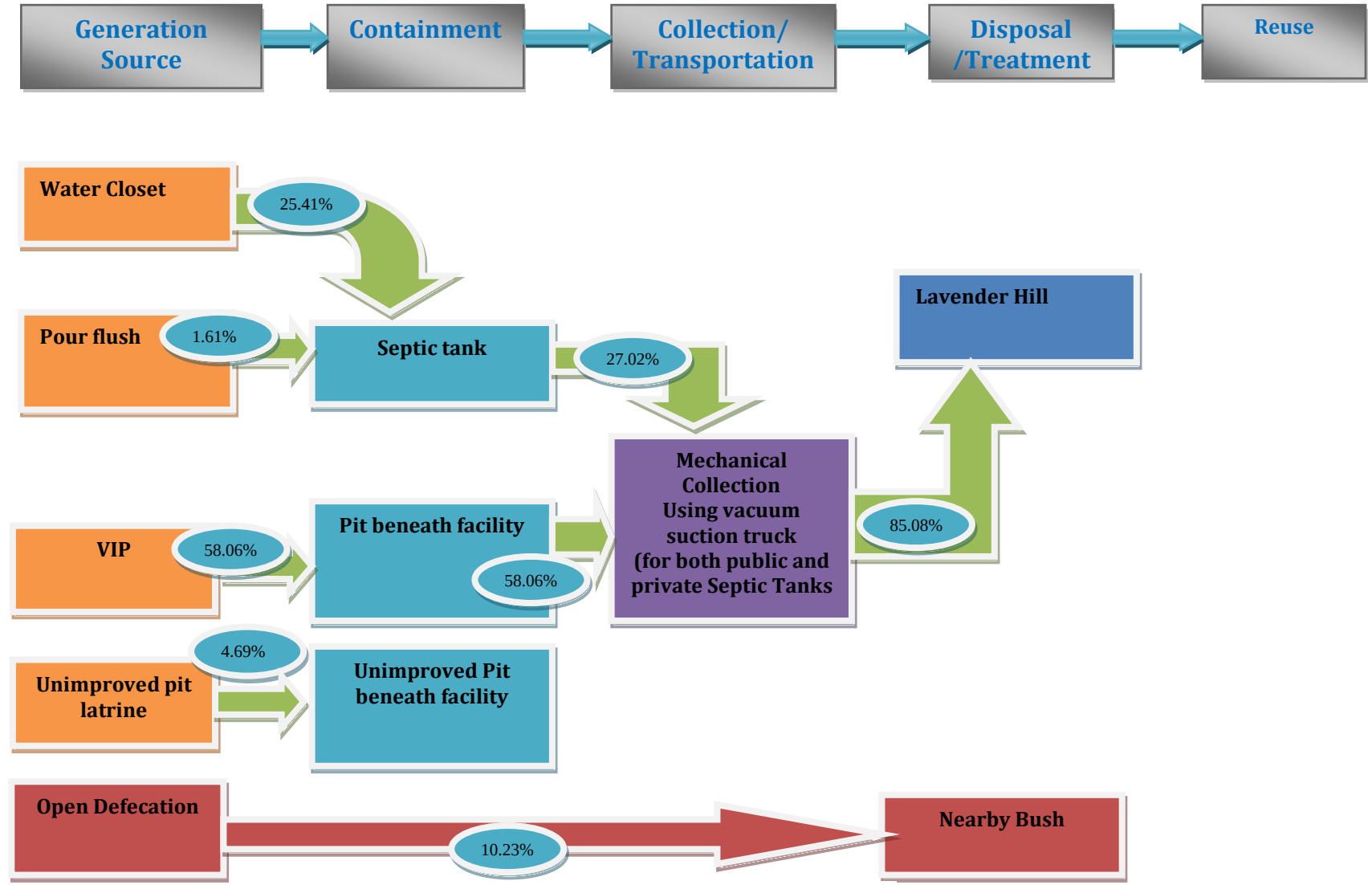


Figure 2.5: Shit Flow Diagram for Ngleshie Amanfro

2.3 Solid Waste Management

2.3.1 Classification of Households Solid Waste Containers

Bins, sacks and polythene bags are the predominantly used household solid waste storage receptacles. Together they account for 76% of storage receptacles used by households. 32.8% of the households indicated using standard waste bins.

Households that use other multiple refuse receptacles for waste collection accounted for 0.7% of the households (see Figure 2.6 below).

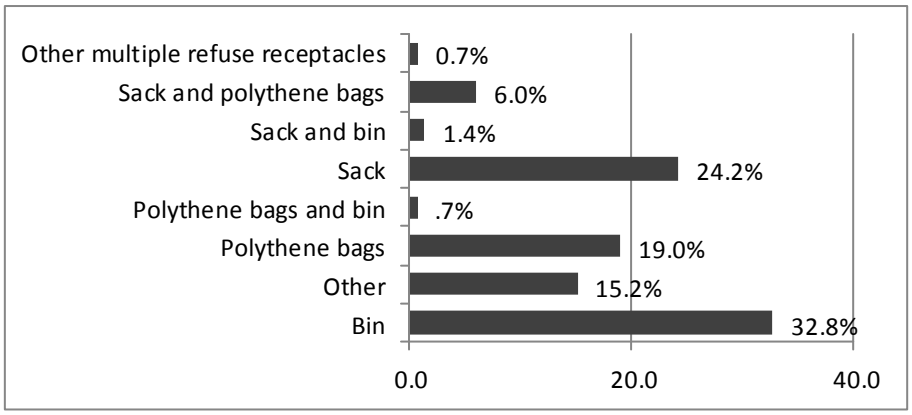


Figure 2-6: Solid waste storage receptacles

2.3.2 Household Waste Collection Methods

As shown in Figure 2.7 below, door-to-door waste collection alone accounts for 43.6% of household waste disposal methods. The service is provided by private waste collection service providers under franchise license agreement with the Municipal Assembly (MA) and private individuals using tricycles ('Borla Taxis'). The 43.6% coverage is significantly lower than the regional average of 48.5%. Another 30% of the residents also indicated the use of domestic trenches while only 6.6% indicated the use of communal containers located at designated points by the MA, Women and children who are usually responsible for gathering, storage and disposal of solid waste in the household therefore resort to the use of the open/crude dump sites (accounted for 6.5% of the responses). The refuse disposed in the domestic trenches are often burnt after some days of piling up.

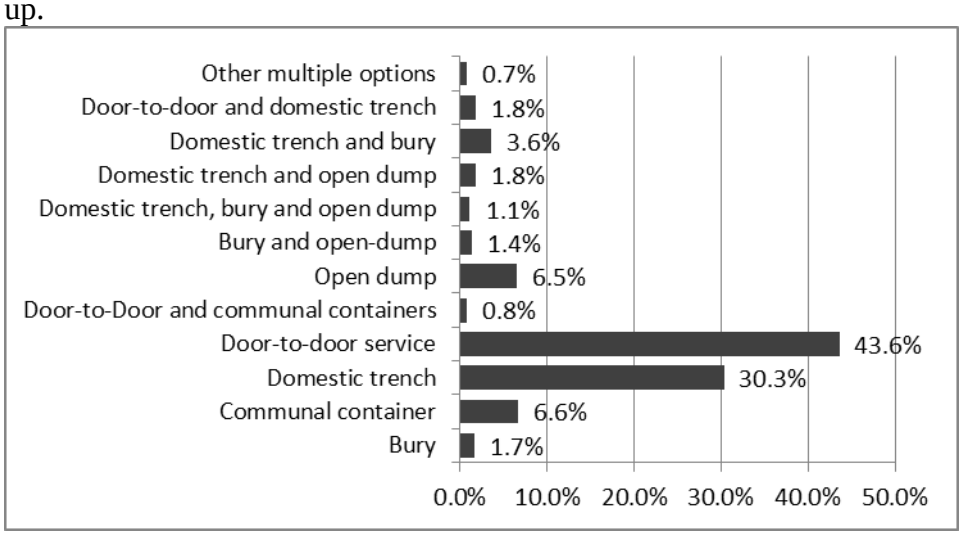


Figure 2-7: Solid waste disposal methods

Plate 2.2: Crude dumping and burning of waste at Galilea Market area

Plate 2.3: Crude dumping and burning of waste at Amanfro Zongo area

2.4 Sullage Disposal and Stormwater Conveyance

Majority of the households in the community dispose of sullage, kitchen and bathroom wastewater on bare ground. Community does not have effective drainage system and therefore kitchen wastewater is mostly thrown in the open. Flooding as a result of the lack of stormwater drains is frequent in most parts of the community after heavy downpours (see plate 2.4 below).

Plate 2.4: Aftermath of flood incidence in some parts of the community

2.5 Existing Water Supply Situation

Piped water from GWCL and Safe Water network (a Non-Governmental Organisation-see plate 2.7 below) are the major water supply service providers in the community. The NGO has four (4) water vending/draw-off points in the community. Raw water for the facility is abstracted from the Densu River. 50.8% of the households however indicated the use of water from GWCL.

Women rely on water for many of their daily chores such as cooking cleaning as well as hygiene needs of the household. With assistance from their children they are responsible for fetching and storing water for household use. They therefore have to get water from various sources for household use.

Plate 2.7: Safe Water Network Treatment Plant in Ngleshie Amanfro

Table 2.5: List of water supply points in Suburbs of Ngleshie Amanfro

Name/Location	Technical Features	Operational & Maintenance Procedures
Beatrice Akpo's Water point	• GWCL water source/ line close to site about 5m away. • Storage capacity is 8,000 litres	• Private water sales point located in Galilea community • A gallon cost 50 pesewas • Average coverage is 10 persons per days
Emma Manyo Water point	• GWCL water line close to site (about 15m away) • 20,000 litres (two number Rambo 1000 on support structures)	• A gallon cost 60 pesewas • Average coverage is 5 persons/day • Constant supply of water • Private water sales point located in Galilea community
Victor's water point/Victory Spot	• 1 number 250 gallons storage tank • Water is tapped from GWCL line about 5m away	• Private water sales point located in Galilea community • A gallon cost 50 pesewas
Safe Water Network	• Site has 4-Rambo 1,000 storage tanks of which 28cm3 of water serve Ngleshie Amanfro community (with 7 standpipes within Ngleshie Amanfro	• It serves about 1800 people within Ngleshie Amanfro • Operational hours: 6:00am to 6:00pm • A gallon cost 30 pesewas
Amanfro Zongo water point	• Water is obtained from GWCL lines along the main road • There is 3500 litre capacity tank on site	• A bucket cost 20 pesewas • A basin cost 50 pesewas
Emmanuel Akagbo's water point (House number 332)	• Obtains water from GWCL • Storage tank has a capacity of 8500 litres	• 20 pesewas per bucket • 40 pesewas per gallon

3. SANITATION IMPROVEMENT OPTIONS

Consistent with the main objective of the GAMA-SWP project of achieving universal sanitation coverage in the community, an estimated 2,994 sanitation facility units will have to be provided in the community by the close of project in 2017. Table 3.1 below provides an estimated breakdown of the household (HH) sanitation facilities required.

Table 3.1: Statistics on Households without Sanitation Facilities

Item	Description	Input Data
1	Total number of persons in households,	19,405
2	Total number of houses,	979
3	Total number of households,	3,914
4	Average household size	5
5	Average number of households per house	4
6	Number of persons per house (using three(3) households per house)	20
7	Households with dedicated toilets in-house	920
8	Households living in compound houses without toilets	791
9	Households living in detached[2] houses without toilets	676
10	Households living in semi-detached[3] houses without toilets	650
11	Households living in temporary structures without toilets	876
12	**Households without dedicated (single-household-use) toilet**	**2,994**
13	**Percentage of Household without dedicated (single-household-use) toilet**	**76.49%**

3.1 Factors Considered for Sanitation Technology Options

The following factors were considered as key in determining specific sanitation technologies/options to marketed to HHs without dedicated toilets in Ngleshie Amanfro:

Table 3.2: Key Factors Considered in Selection of Household Sanitation Technology Options

Factor	Key Indicators
Technical	• Space demand/constraints in compounds/houses for provision of the requisite types and quantities • Population density • Availability of water • Availability of local materials for construction and O&M • Availability of skilled or semi-skilled manpower for construction and O&M • Ease of operation and maintenance
Financial	• Affordability- capital and operation and maintenance management costs • Attractiveness/appropriateness of marketing and financial/franchise arrangements available to households (beneficiaries)
Environmental	• Geographical conditions - soil/water table etc. for design underground sanitation facilities • Enhancement and improvement in environmental conditions • Reduction of incidence of diarrhoeal diseases (and medical expenses?) • Minimal or no impact on immediate environment
Socio-cultural	• Existing socio cultural habits, norms and preferences • Suitability for men, women, children, the physically challenged and the aged. • Enhances beneficiaries income status (reduction in costs of other services) • Involvement of community
Institutional	• Existing institutional arrangements and support for marketing facility models

[2] Not exactly a detached house but share similar features as a detached house
[3] Not exactly a semi-detached house but share similar features as a semi-detached house

3.2 Household Sanitation Technology Options

This section of the report presents a brief report on WASH facilities, services and financial options proposed for upgrading environmental sanitation and water supply services in Ngleshie Amanfro. The recommended technical options and the related costs proposed in this document are based on outcome of literature reviews, assessment of baseline data, field data, physical assessments of WASH facilities and focus group discussions.

Design considerations made in the selection and recommendations of the technical options were based on technical feasibility, local knowledge on functionality and care of use, space demand/constraints, resilience, durability; costs (i.e. capital and O&M), ease of operation and maintenance, ease of construction with local materials and availability of skilled artisans, social and cultural acceptance and inclusiveness; gender preferences; community involvement, feasibility of implementation, financial sustainability, environmental and social impact and benefits.

The sanitation ladder shown in Figure 3.1 gives the incremental improvement options for households latrines focusing on re-use of by-products. Figure 3.2 shows a typical layout of house in Ngleshie Amanfro and the location of proposed household toilet.

1) Category 1: Individual household level sanitation technology options:
   a) VIP
   b) KVIP
   c) Pour flush with septic tank
   d) Pour flush with leach pit
   e) WC/cistern flush with septic tank (single/double)
   f) WC/cistern flush with leach pit (single/double)
   g) Urine diversion toilet (UDT)
   h) Biofil toilet
   i) Biogas toilet
   j) Van's biological toilet
   k) Enviro Loo toilet
   l) Ecosafe toilet
   m) Mulch toilet

In areas of high population and housing density, issues of tenancy and availability of space are very critical elements for installing facilities especially individual household (stand-alone) facilities. Options for shared-block facilities were therefore also proposed.

2) Category 2: Households shared-block sanitation technology options:
   a) Shared-block VIP
   b) Shared block KVIP
   c) Shared block pour flush with shared septic tank
   d) Shared block WC with shared septic tank
   e) Shared block urine diversion toilet (UDT)
   f) Shared block biofil toilet
   g) Shared block Biogas toilet with shared digester
   h) Shared block Van's biological toilet
   i) Shared block Enviro Loo toilet
   j) Shared block Ecosafe toilet
   k) Shared block Mulch toilet

3) Communal network sanitation technology options:

a) WC/cistern/pour flush connected to simplified (condominium) sewer network linked to decentralised/centralised communal treatment system (e.g. decentralised communal septic tank, centralised bio-digester plant or Janicki Omni processor). Details of proposed sewer network and sewage treatment plant are indicated in the Preliminary Design Report for Ngleshie Amanfro Sewerage Network attached as Appendix 5 to this report.

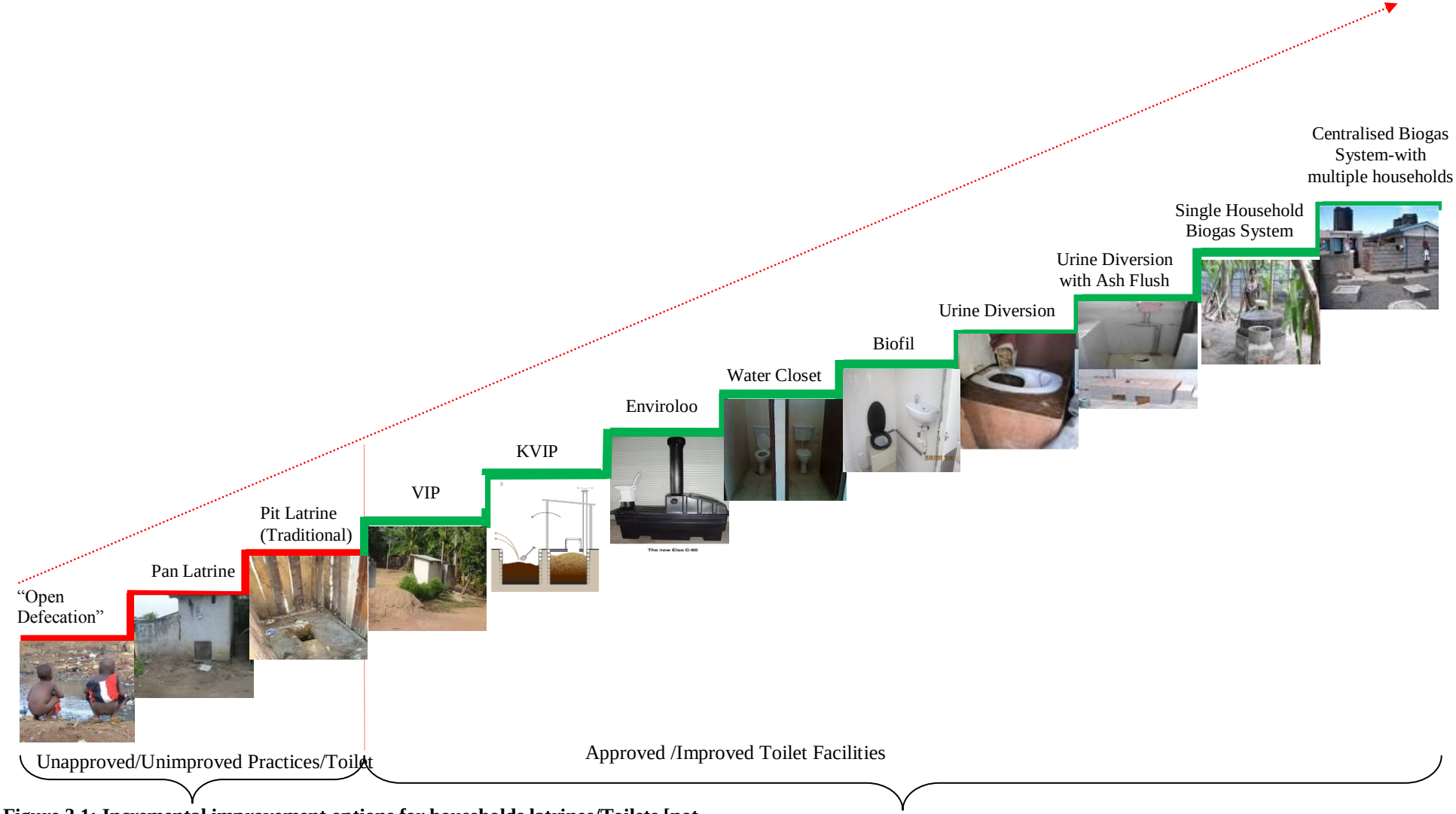


Figure 3.1: Incremental improvement options for households latrines/Toilets [not

Figure 3.2: Typical layout of houses in Ngleshie Amanfro

3.3 Unit Costs for Proposed Household Sanitation Options

Table 3.3 below provides estimated unit costs for each of the proposed options.

Table 3.3: Unit Cost for proposed household sanitation technologies

Facility Type	Estimate Unit Cost (US$)		Total Cost (US$)
	Sub-structure (digester)	Superstructure + Sanitary fixtures cost	
VIP	302.05	130.19	432.24
KVIP	302.05	136.70	438.75
Pour flush with septic tank			1,725.00
Pour flush toilet connected to sewer	100	440.73	540.73
Water Closet (WC)/cistern flush toilet connected to sewer	100	490.85	590.85
Water closet with septic tank	615.38	410.26	1,025.64
Pour flush with leach pit	252.95	620.77	873.72
Water closet with leach pit			1,550.00
Biofil standard digester	384.62	179.49	564.10
Biofil standard digester with sand	384.62	307.69	692.31
Biofil Microflush Standalone	384.62	641.03	1,025.64
Van's Biological toilet			770
Mulch toilet			975
Enviro loo toilet			630.00
Biogas toilet			1,435.00

Table 3.5 below sets out quantities of household sanitation technology/options proposed for households in compound, semi-detached and detached houses without toilets taking into consideration pattern of existing sanitation facility types in the community. The quantities were determined based on the following data inputs (from household and field surveys) and the assumptions in Table 3.4.

Table 3.4: Data Inputs used in calculating quantities of facilities

Data Inputs
Total number of toilets required in compound, semi-detached and detached houses = (198 + 169 + 162) = **529**
Total number of toilets required as shared block facilities for HHs in temporary structures= **219**
40% of the total number of toilets shall be provided as VIPs and KVIPs toilets to HHs living in compounds, semi-detached and detached houses without their own toilets, 8% as HHs-pour flush toilets with septic tanks, 12% as HHs-WC toilets with septic tanks, 4% as HHs-pour flush toilets with leachate pits, 4% as HHs-WC toilets with leachate pits, 15% as HHs-Biofil/Biogas toilets and remaining 13% as HHs-Enviro-loo/ECOSAN toilets.
It is estimated that 90% of HHs leaving in temporary structures will rely on facilities provided as shared-blocked toilets; this brings the total number of shared-block toilets to **197.** This in addition to the **169** single house-household (dedicated) facilities indicated above. The remaining 10% of HHs will still rely on existing shared-block toilet facilities (i.e. **22** toilets already catered for). 52% of 197 share-block toilets shall be provided as and KVIP toilets, 24% as pour flush toilets with septic tanks, remaining 24% as WC toilets with septic tanks in compound, semi-detached and detached houses for HHs leaving in temporary structures.

Table 3.5: Calculation of quantities for proposed household sanitation technology options (Shared-Block)

Toilet Code	Compound/House Type	Type of Sanitation Technology Option	Unit	Quantity
VIP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-vaults VIP Latrine	No.	32
VIP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-vaults VIP Latrine	No.	32
VIP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-vaults VIP Latrine	No.	32
VIP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-vaults VIP Latrine	No.	32
VIP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-vaults VIP Latrine	No.	32
Subtotal Households In-House VIP Toilets				**160**
KVIP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy rooms KVIP toilet	No.	32
KVIP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-privy rooms KVIP toilet	No.	32
KVIP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-privy rooms KVIP toilet	No.	32
KVIP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-privy rooms KVIP toilet	No.	32
KVIP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-privy rooms KVIP toilet	No.	32
Subtotal Households In-House KVIP Toilets				**160**
PFST, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy room pour flush with septic tank	No.	18
PFST, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room flush with septic tank	No.	18
PFST, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room pour flush with septic tank	No.	18
PFST, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-privy room pour flush with septic tank	No.	18
PFST, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-privy room pour flush with septic tank	No.	18
Subtotal Households Pour Flush Toilets with Septic Tanks				**90**
WCST,(CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy room water closet with septic tank	No.	23
WCST, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-privy room water closet with septic tank	No.	23
WCST, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-privy room closet with septic tank	No.	23
WCST, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room water closet with septic tank	No.	23
WCST, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room water closet with septic tank	No.	23
Subtotal Households WC Toilets with Septic Tanks				**115**
PFLP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room pour flush with leachate pit	No.	5
PFLP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room pour flush with leachate pit	No.	5
PFLP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room pour flush with leachate pit	No.	4
Subtotal Households Pour Flush Toilets with Leachate Pits				**22**
WCLP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room water closet with leachate pit	No.	5

Toilet Code	Compound/House Type	Type of Sanitation Technology Option	Unit	Quantity
WCLP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room water closet with leachate pit	No.	5
WCLP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room water closet with leachate pit	No.	4
Subtotal Households WC Toilets with Leachate Pits				**17**
BFG, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room Biofil/Biogas toilet	No.	16
BFG, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room Biofil/Biogas toilet	No.	16
BFG, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room Biofil/Biogas toilet	No.	16
BFG, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room Biofil/Biogas toilet	No.	16
BFG, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room Biofil/Biogas toilet	No.	16
Subtotal Households Biofil/Biogas toilet				**80**
EVL, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room Enviro-Loo Toilet	No.	14
EVL, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room Enviro-Loo Toilet	No.	14
EVL, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room Enviro-Loo Toilet	No.	14
EVL, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room Enviro-Loo Toilet	No.	14
EVL, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room Enviro-Loo Toilet	No.	14
Subtotal Households Enviro Loo Toilets				**70**

The provisional cost estimates for providing all 748 variety of household toilets in Ngleshie Amanfro is **US$ 3,023,699.00.** Details of the provisional costs estimates for these options are provided in Appendix 3.

3.4 Public Sanitation Technology Options

As shown in section 2.2.5, 16-seater aqua privy and 10-seater KVIP public facilities at Manheami/Galilea New town and Galilea respectively are in deplorable conditions (see Plate 3.1 and 3.2 below). It is therefore proposed that these facilities be replaced.

The following assumptions were taken into consideration in suggestion the facility types:

- A transient population of 1,940 (i.e. 10% of the total projected population of 19,405) is targeted
- 50 users per squat hole criteria;

The proposed public toilet options for Manheami/Galilea New town and Galilea public toilets are:

a) 1no. 24-seater WC/cistern flush with septic tank for each of the above public toilets (Option-1)
b) 1no.24-seater pour flush with septic tank for each of the above public toilets (Option-2)

Plate 3.1: External and internal views of dilapidated 10-seater KVIP toilet at Galilea

Plate 3.2: Dilapidated 16-seater aqua privy toilet at Manheami

Table 3.6: Cost estimates for proposed public toilet options

Item	Type of Sanitation Technology Option	Unit	Quantity	Unit Cost (US$)	Amount (US$)
1	24-seater pour flush toilet with septic tank (option-1)	No.	2	36,058.12	**72,116.24**
2	20-seater WC toilet with septic tank (option-2)	No.	2	45,072.65	**90,145.30**

3.5 Faecal Sludge Collection and Desludging Options

The existing method for collection of faecal sludge involves the use of vacuum suction trucks and mainly operated by private service provider operators. The service providers are directly engaged by households and operators of public toilets according to prevailing service charges agreed. From the baseline survey only 6% of the households indicated the desludging services are either very poor or poor. It is therefore recommended that the current service delivery option be maintained with GSMA instituting regulations for improving services including a sanction regime for poor services. Figure 3.3 below shows the modified shit-flow diagram for Ngleshie Amanfro to reflect the mode of collection and desludging of faecal sludge.

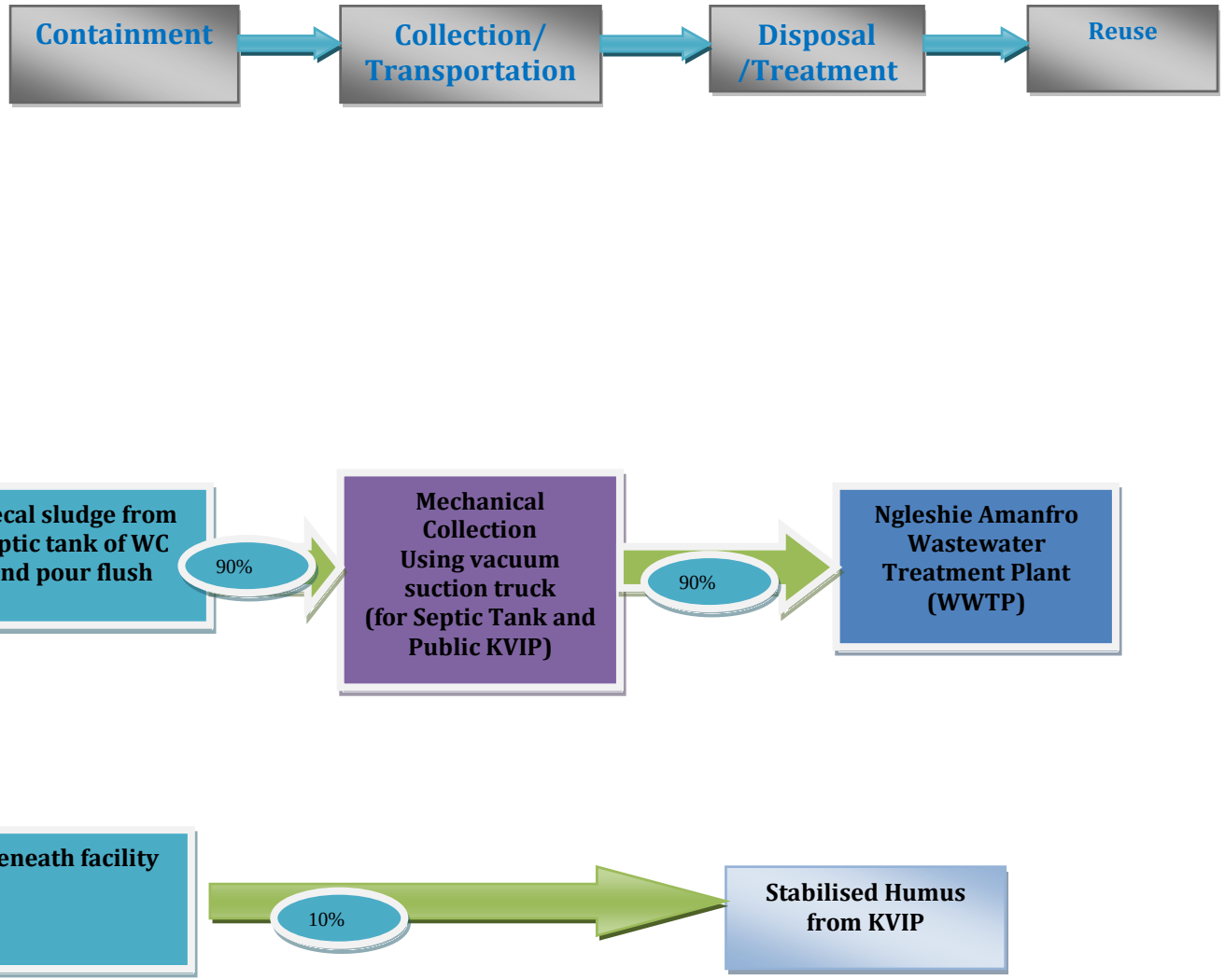


Figure 3.3: Modified Shit-flow Diagram showing projection of 100% wastewater and faecal sludge collection and transport to Ngleshie Amanfro WWTP

3.6 Faecal Sludge Treatment Options

Figure 3.4 below shows proposed faecal sludge treatment options for the community (adapted from the Compendium of Sanitation Systems &Technologies EAWAG -2nd Revised Edition, September, 2014). Table 3.7 highlights some advantages and disadvantages associated with the use of these options

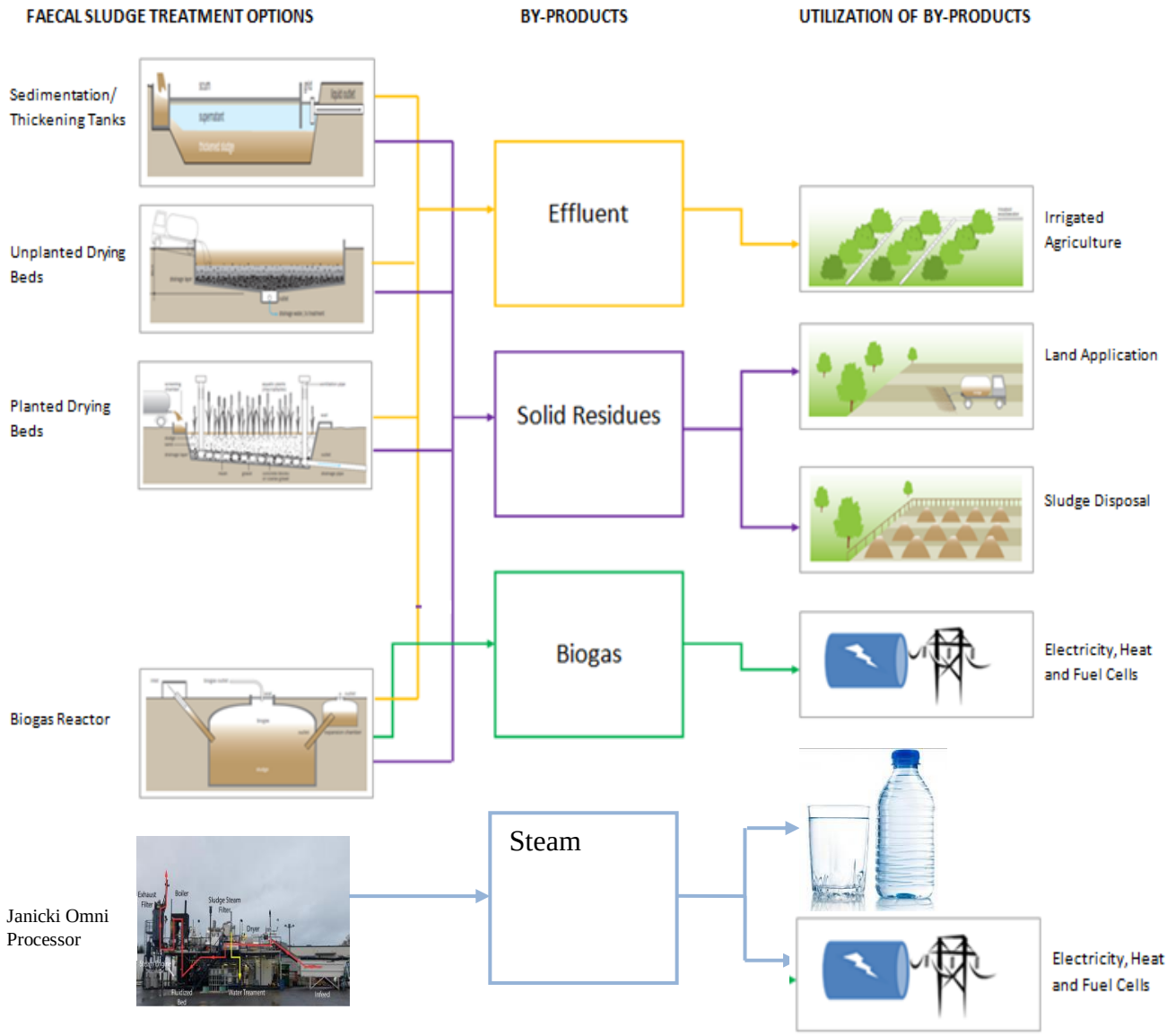


Figure 3.4: Selected Options for Faecal Sludge Treatment

Table 3.7: Assessment of selected faecal sludge treatment options

Treatment Option	Key Features/Treatment Procedure	Advantages	Disadvantages
Sedimentation/ Thickening Tanks	Sedimentation or thickening ponds are settling ponds that allow sludge to thicken and dewater. The effluent is removed and treated, while the thickened sludge can be further treated in a subsequent technology	• Is a low-cost option and can be installed in most hot and temperate climates • Operation and maintenance not intensive • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • No electrical energy is required	• Requires large land space and difficult to site in built-up areas • Issues associated with smell- ponds may cause a nuisance for nearby residents due to bad odours and the presence of flies • Not a "complete" treatment system- thickened sludge and effluent still infectious and requires further treatment before disposal/re-use • Trained staff for operation and maintenance is required to ensure proper functioning • Excessive rain may hinder optimum performance of the system- prevents the sludge from properly settling and thickening • Requires expert design and construction • Long storage times required for thickening of sludge
Unplanted Drying Beds	Is a simple, permeable bed that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates.	• Good dewatering efficiency, especially in dry and hot climates • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • Simple operation, only infrequent attention required • No electrical energy is required	• Requires a large land area • Odours and flies are normally noticeable • Labour intensive removal of dried sludge • Limited stabilization and pathogen reduction • Requires expert design and construction • Leachate requires further treatment
Planted Drying Beds	Similar to an Unplanted Drying Bed but has the added benefit of transpiration and enhanced sludge treatment due to the plants. The key improvement of the planted bed over the unplanted bed is that the filters do not need to be desludged after each feeding/drying cycle. Fresh sludge can be directly applied onto the previous layer; the	• Can handle high loading of faecal sludge • Better sludge treatment than in Unplanted Drying Beds • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • Fruit or forage growing in the beds can generate income • No electrical energy required	• Requires a large land area • Odours and flies may be noticeable • Trained staff required to ensure proper functioning • Long storage times • Labour intensive removal • Requires expert design and construction • Leachate requires further treatment- Faecal sludge is hazardous and anyone working

Treatment Option	Key Features/Treatment Procedure	Advantages	Disadvantages
	plants and their root systems maintain the porosity of the filter.		
Biogas Reactor	A biogas reactor or anaerobic digester is an anaerobic treatment technology that produces (a) a digested slurry (digestate) that can be used as a fertilizer and (b) biogas that can be used for energy. Biogas is a mix of methane, carbon dioxide and other trace gases which can be converted to heat, electricity or light.	• Generation of renewable energy • Small land area required (most of the structure can be built underground) • Applicable at the household level, in small neighbourhoods or for the stabilization of sludge at large wastewater treatment plants • Similar level of treatment but with the added benefit of biogas generation • Long service life • No electrical energy required • Conservation of nutrients • Low operating costs The pilot 5m^3 biogas plan at Edina Essaman was constructed at an estimated cost of US$90,000.	• Requires expert design and skilled construction • The highest levels of biogas production are obtained with concentrated substrates, which are rich in organic material. e.g. as animal manure and organic market or household waste • Incomplete pathogen removal, the digestate might require further treatment • Limited gas production below 15 °C
Janicki Omni Processor	An alternative to the anaerobic digestion faecal sludge treatment system is the Janicki Omni-Processor. The waste-to-energy (WtE) plant (Omni-processor) treats the faecal sludge in an environmentally friendly manner producing electricity and treated water as it end/by-products. The processor is currently being piloted in a 12.3 m$^{3/}$day facility in Dakar, Senegal at an estimated cost of US $1.5 Million. To achieve optimum efficiency, household solid waste could be mixed the sludge from the hydro-segregation tank to enhance combustion and hence energy generation. This may potentially reduce the burden of solid waste management which has been a major challenge for most MMDAs in the country. For communities where the potential for re-use is high, the Janicki Omni-processor treatment plant can be assessed as an alternative to biomethanation (biogas). Further detailed feasibility study is required to establish the capacity of the plant as well as its viability in the local context. The initial investment cost of treatment using Janicki, US $125,000 per m^3, is comparatively higher.		

Adapted from Final Technical, Financial and Management Report -Development of Technically Feasible, Socially Acceptable and Financially Viable Toilets and Faecal Sludge Management in Some Rural Areas and Small Towns in Ghana, CWSA, 2015 and prepared by WasteCare Associates.

Proposed faecal sludge treatment options are:

- Block Septic Tanks
- Block Bio-digesters/Biogas (see Figure 3.5)
- Janicki Omni Processor treatment plant.

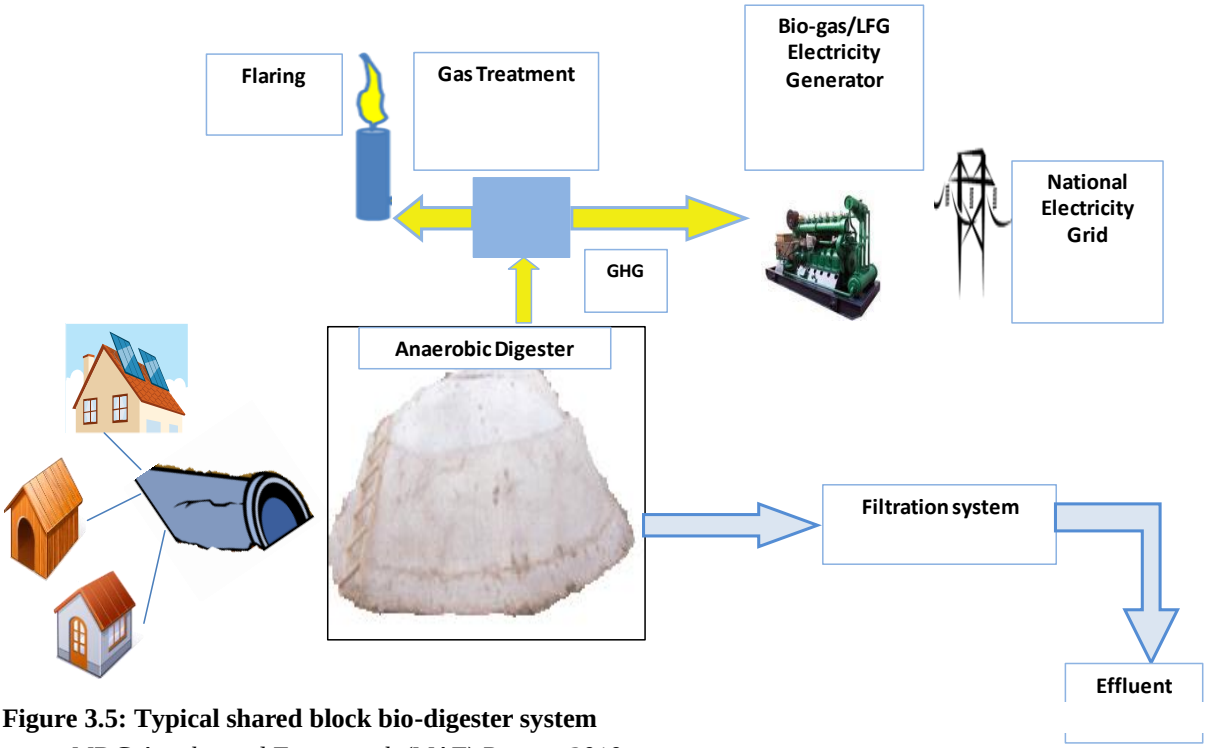


Figure 3.5: Typical shared block bio-digester system

Source: MDG Accelerated Framework (MAF) Report, 2010

3.7 Household Latrine Promotion Models

Training of Sanitation Activists/Canvassers: in order to ensure that household latrine promotion improves in the community, a number of community activists/canvassers for home latrine promotion have been trained as part of the GAMA SWP. The activists/canvassers have been trained on the recommended sanitation technology options and are expected to share information and deepen community members' understanding of the project benefits.

Artisan Driven Model: this model aims at creating a sustainable artisanal delivery of household toilets with the artisan carrying out both marketing and construction of toilets for households. In this model the artisan procures the materials and carries out all the construction works. Previous experiences show that if the artisans' businesses are project-driven then the demand from households for artisans' services often decline at the end of the project. This model can be sustained if the artisan is self-motivated and engaged in a sanitation business which is demand-driven (see Figure 3.6 below).

The artisan driven model is enhanced by the extension of credits to households by microfinance institutions and other financial intermediaries for home improvement including acquisition of household toilets. Existing groups like the Artisans Association of Ghana with offices in Accra and Ashaiman, and community savings groups will be engaged in the promotion of home improvement. This has the potential of increasing the construction of toilets by households.

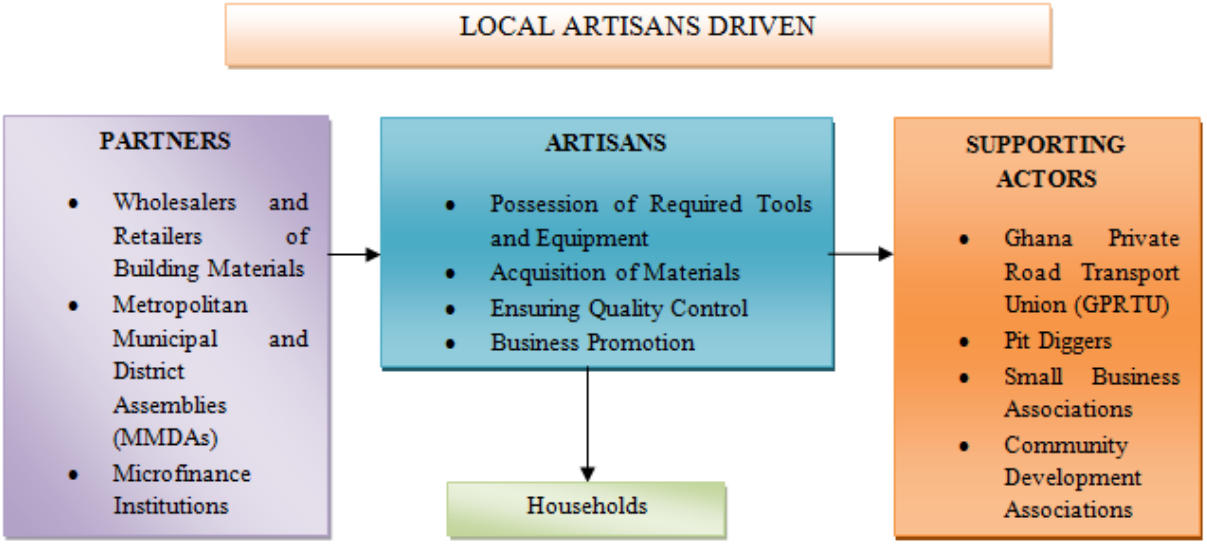


Figure 3.6: Key actors and roles of the local artisan driven household latrine promotion model
Source: UNICEF-GOG WASH Programme, Vol. 1 Assessment Report on Applying Business Solution and Micro-finance to Rural Sanitation Delivery in Ghana, 2014 by CDC Consult Limited, Accra, Ghana

Enterprise Solution: this proposed model involves a network of existing registered enterprises that engage trained artisans and/or agents to promote market and/or construct the recommended household toilet options. The artisans are paid direct labour costs for constructing a facility.

The trained agents are either paid-employees of the enterprises or are engaged on retainer basis and paid a percentage of the total cost of an installed facility. The operations of enterprises are not limited to the jurisdiction of any particular MA and may operate GAMA-wide.

The Ghana Federation of the Urban Poor Toilet Makers Company is an example of a registered Sanitation Enterprise operating at GAMA- wide level. Enterprises registered (or Licensed) by MAs may provide training to community members of the Sanitation Improvement Facilitation Team (SIFT) to promote the construction of household toilets in the community. The inclusion of various financial institutions (commercial banks and microfinance institutions) which advance credits to households to finance home improvements, including household toilets, has the potential for sustaining latrine promotion. The key features of the model are detailed in Table 3.8 of this document.

Table 3.8: Enterprise solution model for household toilets

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr>
<td rowspan="2"> 
1.MMDAs
2.NGOs
3. Hardware Suppliers
4. Transport sector operators
5.Commercial Banks
7.Microfinance Institutions
8. Entrepreneur involved in latrine promotion.</td>
<td> 
1.
Entrepreneur markets household latrines.
2. Households secure funds (loans from microfinance institution) to construct household toilets.
3. Artisans/households procure materials for construction
4.Artisans construct household toilets
5. Household/MFI settles balance of facility cost.
6. Latrine promotion entrepreneur pays artisans labour costs</td>
<td rowspan="2"> 
1. Promoting a clean environment.
2.Reducing environmental pollution and degradation
3.Sustaining the health and well-being of communities
3. Increasing socio-economic activities and gains in the environmental sanitation value chain.
4. Constructing household toilets.</td>
<td> 

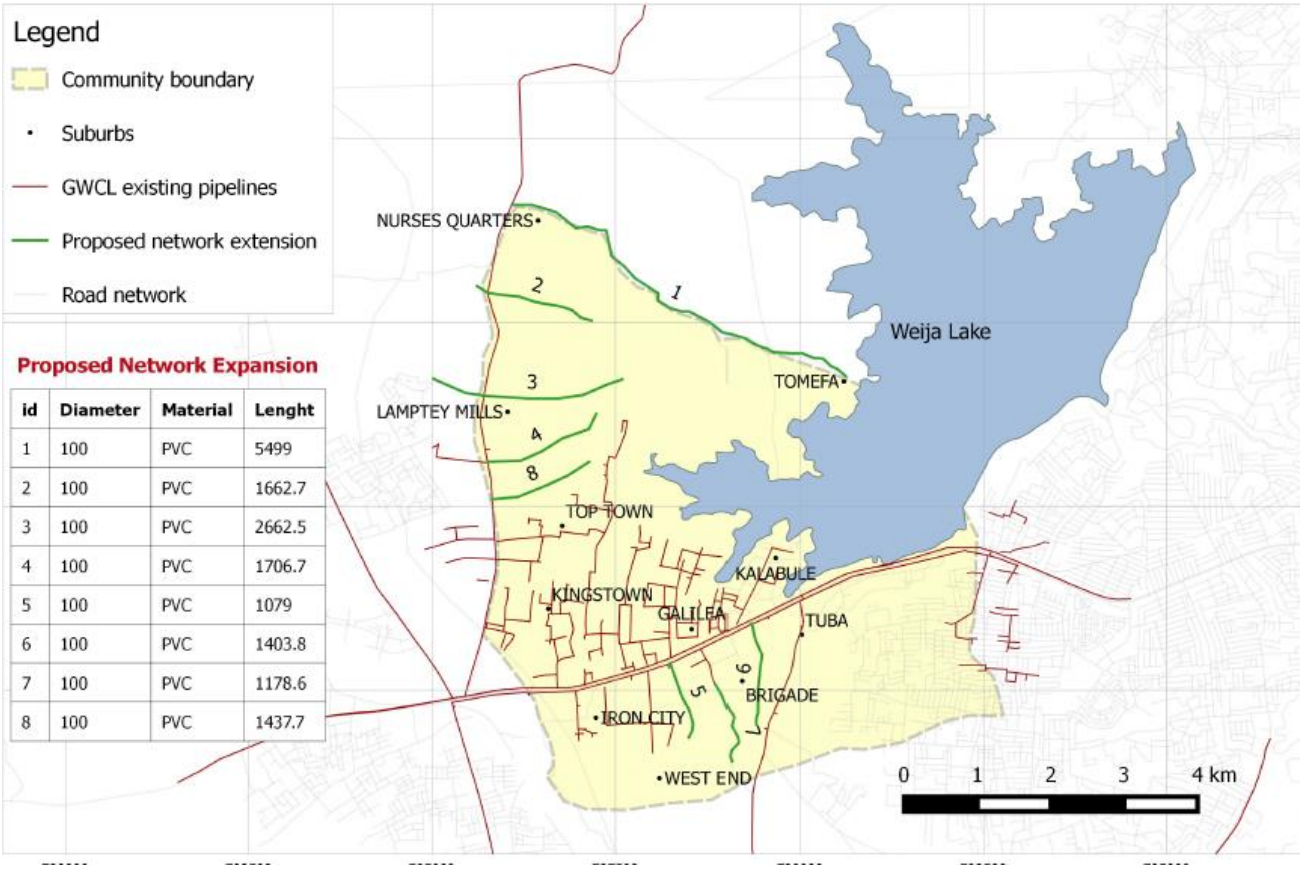
1. National, Municipal Assembly, Artisans and entrepreneur move from house to house to market toilets
2. Artisans maintain contact within the community for future engagements</td>
<td rowspan="2">Households</td>
</tr>
<tr>
<td>KEY RESOURCES
Well trained household artisans.
Efficient Hand tools
Toilet construction materials</td>
<td>CHANNELS OF DISTRIBUTION
 

House-to-house canvassing</td>
</tr>
<tr>
<td colspan="2">COST STRUCTURE
 
Toilet construction materials
Entrepreneur’s fees
Artisan commission</td>
<td colspan="3"> 
REVENUE STREAMS
Household savings
Micro finance loans and advances
Entrepreneur’s profit
Household Artisan’s commission</td>
</tr>
</table>

4. WATER SUPPLY IMPROVEMENTS AND COSTS

4.1 Extension of Distribution Lines into Ngleshie Amanfro

Ngleshie Amanfro has GWCL water supply. However, parts of Ngleshie Amanfro need extension of distribution lines. Figure 4.1 presents an overview of the proposed extension of distribution pipelines while Figure 4.2 gives the status of GWCL water supply connection in the community. Table 4.1 presents the cost of extending distribution lines to households without water supply.



Proposed Network Expansion

id	Diameter	Material	Lenght
1	100	PVC	5499
2	100	PVC	1662.7
3	100	PVC	2662.5
4	100	PVC	1706.7
5	100	PVC	1079
6	100	PVC	1403.8
7	100	PVC	1178.6
8	100	PVC	1437.7

Figure 4.1: Water supply needs assessment of Ngleshie Amanfro

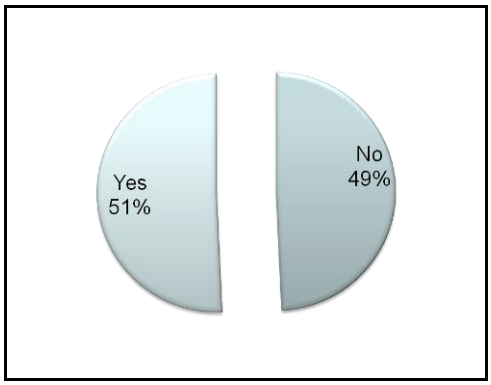


Figure 4.2: Status of GWCL pipe connection in the community

Table 4.1: Cost of extending distribution mains to sections of Ngleshie Amanfro without Water lines

Item	Description	Amount (USD)
1	General Items and Preliminaries	12,307.69
2	Site Clearance	30,115.38
3	Excavation and backfilling	174,282.05
4	Pipe-Laying works	285,110.26
5	Chambers and Pipework Ancillaries	47,512.82
6	Standpipes	119,230.77
7	**Subtotal**	**668,558.97**
8	Contingencies (15% of subtotal)	100,283.85
9	**Total**	**768,842.82**

A draft tender document including conceptual designs and bill of quantities for the extension of distribution pipelines is attached to this report as Appendix 6.

5. SOLID WASTE IMPROVEMENT AND COSTS

5.1 Household Solid Waste Collection and Storage Improvements

According to the baseline survey, about 32.8% of the households use bins as refuse receptacles. It is therefore recommended that the use of 240L bins need to be encouraged to improve storage of household waste in compound, semi-detached and detached houses. Table 5.1 below presents the cost of provision of bins to households without their own bins.

Table 5.1: Estimation of cost of provision of Household (HH) bins

S/No.	Indicator (Based on Baseline Survey)	Value
1.0	Total number of households	5,291
2.0	HHs relying on door-to-door waste collection system is (43.6%)	2,307
3.0	Number of HH with bins = (32.8% of Item 1)	1,735
4.0	Targeted number of bins for HH that rely on door –to-door but without standard bins (Item 2-Item 3)	571
5.0	No. of 240l bins required in houses to ensure 100% of door-to-door coverage	571
6.0	Unit cost provision and supply of 240l bins to houses by the MA in US$	70
7.0	**Cost of supply of bins in US$**	**39,970.**

5.2 Improvements for Waste Segregation

The baseline survey indicated that only 8% of the households interviewed segregate their household waste. It is therefore recommended that separation of household waste be promoted using the strategies described below:

- Introduction of recyclable waste buyers to community and encourage households to separate recyclable waste from non-recyclable waste to enhance buyers to buy them from homes.
- Setting up a buy back centre equipped with buy back equipment (that can process recyclable materials), floor area 207m^2.

Table 5.2 provides plastic generation of residents/households in Ngleshie Amanfro.

Table 5.2: Estimation of volume of plastics generated in a day

Population	Total waste generated per day (m^3)	Volume of plastics per day (m^3)
20,238	60.71	9.23

5.3 Improvement in Communal Waste Collection

The WASH inventory revealed that there is a dumpsite about 200m away from Galilea market. The refuse dump is very unsightly and has only one skip container. The site does not have well engineered refuse holding bay hence refuse is dumped indiscriminately at the sites. It is recommended that refuse holding bay be constructed. Three (3) skip pads/holding bays (70m^2 floor area) with solid platforms for three (3) communal refuse collection containers is recommended. This is to ensure better handling of refuse management situation at the site including provision of one (1) toll booth (7.29m^2 floor area) for collection of user fees.

The site lacks any drainage measures controlling surface runoff and effects of erosion. Estimated total length of U450 side ditches for the sanitary site including U600 outfall drain that will discharge runoff water from the site to the nearby outfall is shown in Table 5.3 below

Table 5.3 presents the estimated cost for carrying out all construction works outlined above at the dumpsite site.

Table 5.3: Cost of refurbishing Galilea market dump site

Item	Description	Amount in US$
1.0	Construction of 1no. Toll Booth, 7.29m^2 floor area	3,350.00
2.0	Construction of 3no. solid waste holding bays (SWHB), 70m^2 floor area	14,650.00
3.0	Improvement of graveled access road to site, 260m road length	98,000.00
4.0	Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	155,750.00
5.0	Construction of plastic buyback center equipment inclusive, 207m^2	97,900.00
6.0	**Total for transfer station improvements**	**369,650.00**

6. SULLAGE AND STORMWATER DISPOSAL AND COSTS

6.1 Construction of Soakpit

The entire Ngleshie Amanfro lacks a well-planned drainage system needed for conveyance of grey water, through tertiary drainage into adjoining secondary and primary drainage network to suitable outfalls points. This explains why the numerous earthed drains in the area created by erosion, discharges grey water to nowhere creating unsightly conditions.

Site observations revealed that majority of the houses situated in the area have adequate space for construction of soakage pits because soils in the area appears favorable for soakage/absorption of wastewater.

Simple percolation tests may be conducted at few selected locations in the area. This will help to establish average filtration potential of soils in the area for design of soakage pits.

It is proposed that all houses in the area be provided with technical support for constructing their own simple soakage pits located at the back of bathhouses to dispose of household sullage, particularly from bathhouses. Similarly simple uPVC pipes may be laid to connect to the simple soakage pits to discharge grey water from kitchens. The soakage pit will be sized using the estimated amount of wastewater generated by occupants and grey water generation rates.

Simple excavated pits filled with boulders are appropriate for filtration and infiltration of the wastewater.

The cost of materials includes cement and sand for blocks and $1m^3$ of clean granite boulders from nearby quarries distributed to each house including payment of skilled masons for construction is about **US$ 153.36** per house of an average of 20 occupants determined by the baseline statistics.

Table 6.1 below presents of the cost required to construct soakage pits in 834 houses within the project area. The estimated cost is **US$ 127,912.55**.

Table 6.1: Cost of constructing HH soakage pits Ngleshie Amanfro

Item	Description (Based on Baseline Survey)	Amount in US$
1	Cost of $1m^3$ of boulders ex-site including transport from quarry to each house	52.63
2	Cost of 3-bags of cement to each house for block moldings & construction	27.63
3	Cost of buying and transporting $1m^3$ of sand to each house for construction	39.47
4	Free HH level support for digging soakage pit by the occupants	-
5	1-skilled mason plus 1 labourer to assist HH to construct soakpit to design standards	26.32
6	**Subtotal**	**146.05**
7	5% of Subtotal as contingency for any unforeseen expenditure	7.30
8	**Unit rate for construction 1-soakpit**	**153.35**
9	Number of houses requiring soakpits under this subproject (85.2%)	834
10	**Total for soakpits construction**	**127,912.55**

6.2 Stormwater Conveyance

Existing Situation

The primary drainage system in the community comprises of the Densu river tributaries in the north east and the Okurudu stream in the south west. Neither of these primary drainage channels is lined. The existing network of secondary and tertiary drains is insufficient to convey runoff from the community and along the access roads to the natural stream channels. The absence of appropriate inlet structures to the primary drainage systems also limits the effective routing of flow from the secondary/tertiary drains leading to local flooding in many areas any time it rains.

Plate 6.1: Un-engineered road with side drains

Plate 6.2: Un-engineered road without side drains

Plate 6.3: Culvert crossing on road

Plate 6.4 Ponding of road surfaces

A flood risk map developed from the baseline household survey responses on the incidence and frequency of flooding occurrences is presented in Figure 6.1. The Kingstown suburb which is depicted in Figure 6.2 was subsequently identified as a high flood risk area that requires urgent intervention in consultation with the Ngleshie Amanfro community representatives.

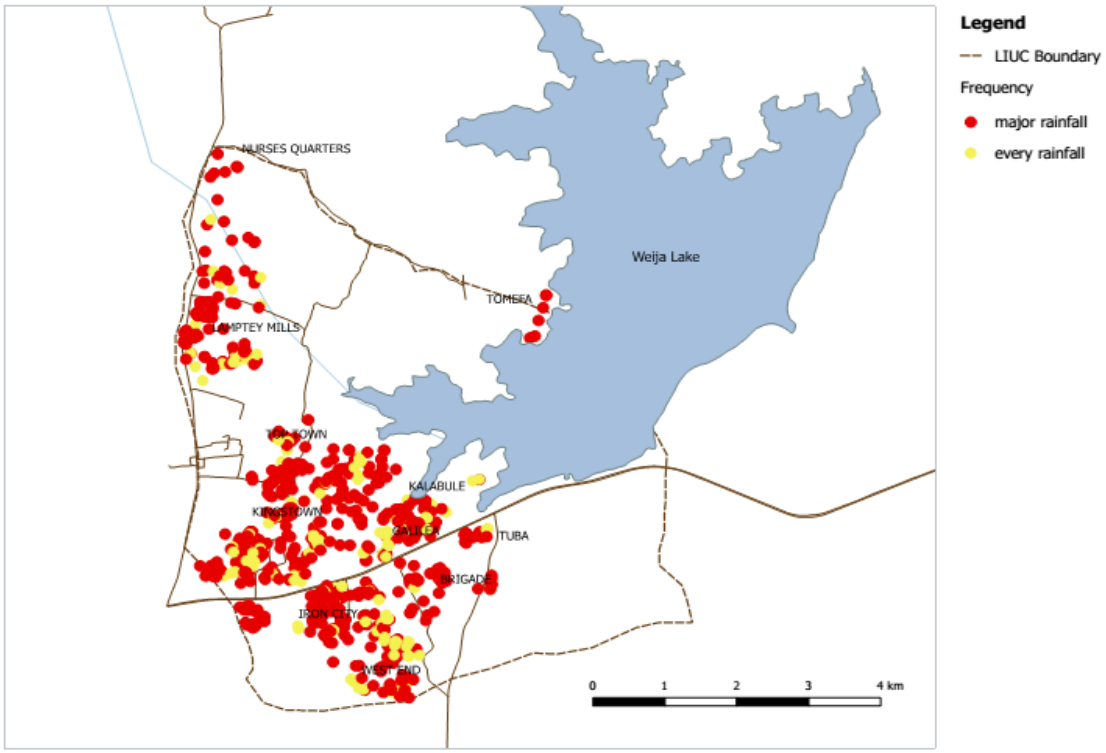


Figure 6.1: Flood risk map

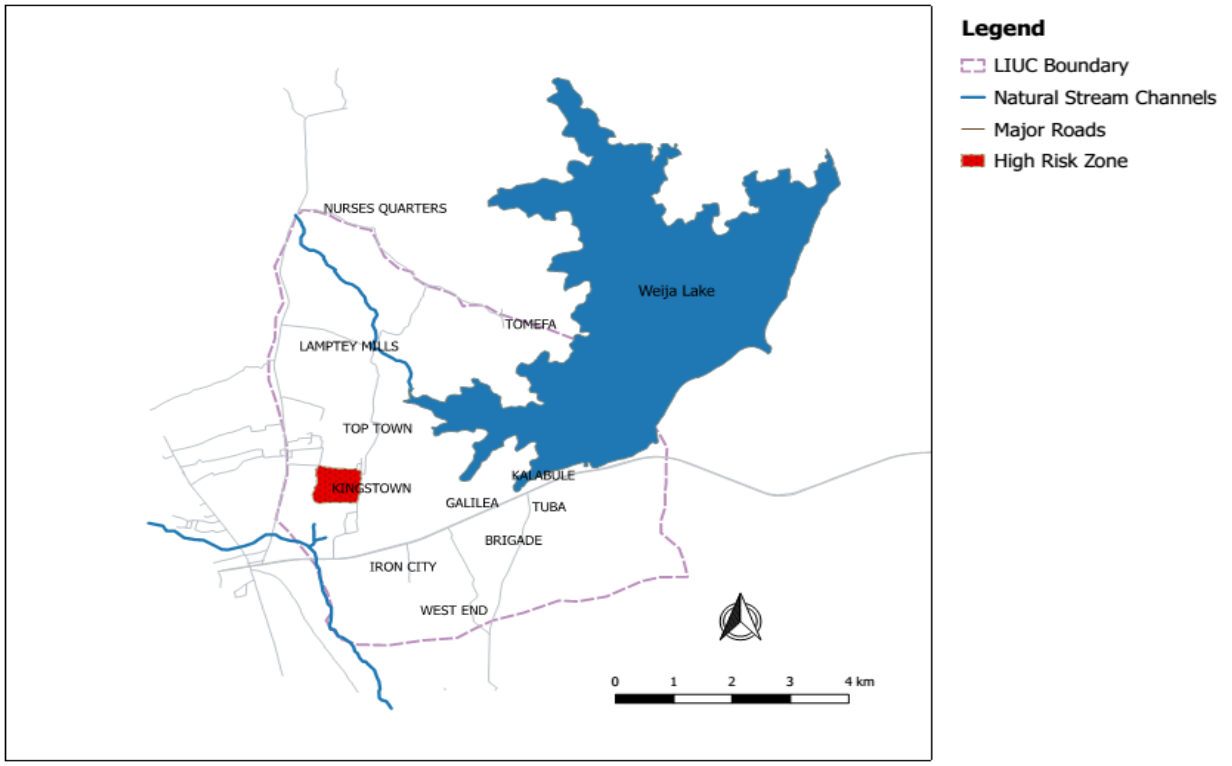


Figure 6.2: High risk flood zone

6.3 Storm Water Conveyance Improvement Options

The specific locations identified in Kingstown for prioritized interventions are No Weapon, Darius, Brother Lee, Salma Palace, and Apegya Back. The objective of the intended intervention is to increase the density of secondary and tertiary drains which will convey runoff to the Accra–Cape Coast highway drainage network via the main access roads from the community. A culvert crossing near the secondary school will also have to be re-engineered to facilitate gravity flow. The cost of drainage intervention is estimated at **US$ 287,800.00.**

Table 6.2: Proposed drains

Location	Type	Length (m)
No Weapon	U drains	531
Brother Lee	U drains	362
Darius	U drains	248
Apegya Back	U drains	298

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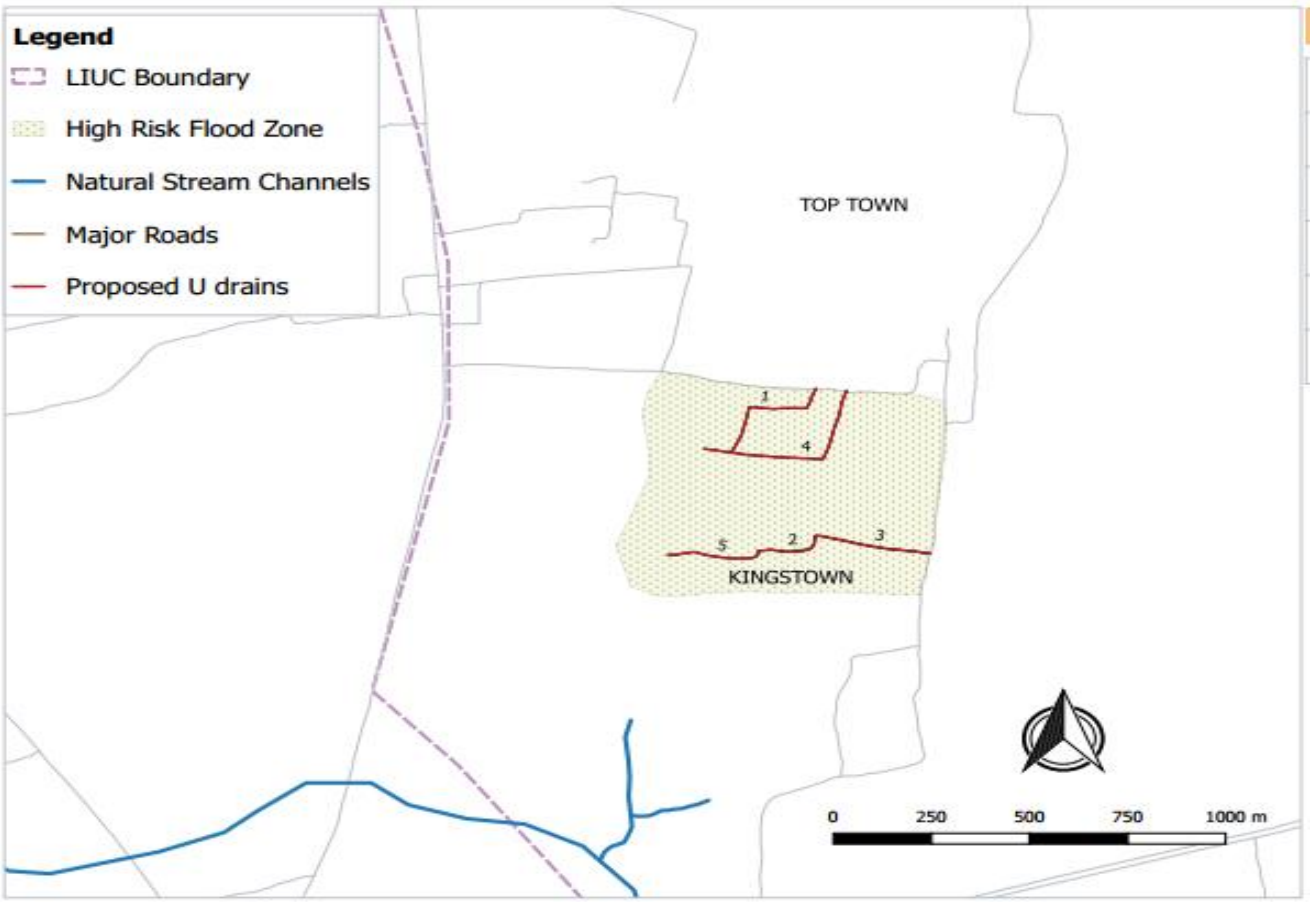


Figure 6.3: Proposed secondary and tertiary drains

7. INSTITUTIONAL ARRANGEMENTS

7.1 Ga South Municipal Assembly

In line with National Policy, the MA will gradually move away from direct provision of environmental sanitation services, and instead will promote active involvement of both communities and the private sector in the delivery of WASH services. As part of its functions, the MA will mobilize resources to implement the proposed communal/bulk WASH infrastructure interventions (e.g. condominium sewer network, communal refuse collection stations, water supply upgrade, etc.), supervise the design and construction of the facilities and oversee service contracts. The MA will set and enforce the required regulations for the sustainable operation and maintenance of the interventions.

The bulk or communal WASH infrastructure interventions will be owned by the MA. To ensure sustainability of operation and maintenance of the bulk/communal infrastructure interventions (including the proposed sewer network), it is recommended a Management Committee involving representatives of the following are formed:

- The Municipal Assembly
- Traditional/local Chiefs
- Ngleshie Amanfro Community
- Local Opinion Leaders
- Ghana Water Company Limited
- Other relevant stakeholders

This body or committee could as well be the proposed Water and Sanitation Users Association (WSUA).

7.2 GSMA Waste Management Department

According to the Local Government (Department of District Assemblies) (Commencement) Instrument, 2009 (L.I. 1961), the Waste Management Department (WMD) has been mandated to provide facilities, infrastructural services and programmes for effective and efficient waste management for the improvement in the environmental sanitation, the protection of the environment and the promotion of public health. It is recommended the liquid waste section manages the programmes for households (home latrine promotion) and public facilities (neighborhoods and commercial areas). The solid waste section will also have oversight responsibility for solid waste improvement (including establishment and effective operation of "buy-back" centre, sullage and drainage infrastructure).

The Works Department will assist in facility design and procurement of works. It is expected that technical assistance to the GSMA-WMD in the areas of planning and M&E will be provided through the Municipal Planning Coordinating Unit (MPCU).

7.3 Private Service Contractors

Currently the operation and maintenance of public toilets (sanitary sites) has been franchised to private service providers. It is recommended the existing arrangement be maintained.

Regarding the operation and maintenance management of the proposed sewer network and septage treatment plant, it is recommended the MA procures the services of a private operator. The private operator will as well be responsible for the collection service charges or fees from service users (households connected to the sewer network).

A similar system has been in operation under the Pilot Asafo Simplified Sewerage Scheme in Kumasi since 2000. Under the scheme, households are however responsible for in-house plumbing and block sewer repairs and maintenance while the KMA supports the repair of street sewer blockages and damages to trunk sewer lines and man-holes as well as desludging of anaerobic ponds.

8. SUMMARY OF TECHNICAL AND FINANCIAL OPTIONS

8.1 Implementation Packages

The facilities required to provide immediate interventions are set out in Table 8.1. As the project evolves and more data becomes available the subsequent years' interventions shall be updated. The facilities under the various components are grouped into financing packages. The estimated cost of each package is also given in Table 8.3.

In summary, the total cost of Phase 1 is estimated at **US$ 6,135,282.32** out of which 82.78% would be for sanitation intervention, 12.53% for the extension of distribution pipelines in the community and 4.69% will be for drainage intervention. The solid waste improvement and sullage disposal interventions are to be implemented under phases two (2) and three (3). Appendix 4A and 4B gives a summary of cost of the various interventions.

Table 8.1: Detailed financing cost of project

Projects Components	Financing Option (US$ Million)					
	IDA Credits	Other Donors	Central Government	Metro/Municipal Assembly	Household Beneficiaries	Total
COMPONENTS TO BE IMPLEMENTED						
A. Construction of soakpits					0.13	0.13
B. Construction of Stormwater drain				0.30		0.30
C. Construction of Household Toilet					3.10	3.10
D. Construction of a public toilet				0.10		0.10
E. Construction of Simplified Sewer systems	7.20					7.20
F. Construction of Centralized bio-digester sewage treatment plant	2.60					2.60
G. Provision of litter bins to households					0.40	0.40
H. Provide sanitary sites with ancillary facilities (communal containers and refuse holding bays)				0.37		0.37
I. Extension of Pipelines	0.77					0.77
Total	**10.57**			**0.77**	**3.63**	**14.97**

Table 8.2: Facilities to be provided under the proposed financing packages

Component Description	Total	Phase 1 (2016 - 2019)	Phase 2 (2020 – 2023)	Phase 3 (2024 -2027)
1. Excreta (Liquid Waste) Management				
Construction of household toilets				
Construction of VIP Latrines	160	160		
Construction of KVIP Latrines	160	160		
Construction of pour flush with septic tank	90	90		
Construction of water closet with septic tank	115	115		
Construction of pour flush with leach pit	22	22		
Construction of water closet with leach pit	17	17		
Construction of Biofil/Biogas toilet	80	80		
Construction of Enviro loo	70	70		
Construction of simplified sewer for communities in Basin A	NA			
Construction of simplified sewer for communities in Basin B	NA			
Construction of simplified sewer for communities in Basin C	NA			
Construction of centralised bio-digester sewage treatment plant for Basin A (STP 1)	1			
Construction of centralised bio-digester sewage treatment plant for Basin B (STP 2)	1			
Construction of centralised bio-digester sewage treatment plant fir Basin C (STP 3)	1			
Construction of a public toilet	2		1	1
2. **Drainage and Sullage Improvement**				
Construction of soakpits	834		417	489
Construction of 1439m of U600 drain for stormwater conveyance	NA			
3. Solid Waste Management				
Provision of litter bins to households	839		420	419
Construction of 1no. Tool Booth	1			
Construction of 1no. Solid Waste Holding Bay (SWHB)	1			
Improvement of graveled access road to site, 260m road length	NA			
Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	950m			
Provide sanitary sites with ancillary facilities (communal containers and refuse holding bays)	1		1	
4. Water Supply Improvement				
Extension of Distribution pipelines	NA	100%		

Table 8.3: Cost for components studies for comprehensive environmental sanitation coverage

Component Description	Total (USD)	Phase 1 (2016 - 2019)	%	Phase 2 (2020 - 2023)	Phase 3 (2024 -2027)
1. Excreta (Liquid Waste) Management					
Construction of household toilets					
Construction of VIP Latrines	276,633.60	276,633.60	4.51		
Construction of KVIP Latrines	280,800.00	280,800.00	4.58		
Construction of pour flush with septic tank	624,600.00	624,600.00	10.18		
Construction of water closet with septic tank	471,794.40	471,794.40	7.69		
Construction of pour flush with leach pit	74,266.20	74,266.20	1.21		
Construction of water closet with leach pit	130,400.00	130,400.00	2.13		
Construction of Biofil/Biogas toilet	328,204.80	328,204.80	5.35		
Construction of Enviro loo	837,000.00	837,000.00	13.64		
Construction of simplified sewer for communities in Basin A	4,118,063.25			4,118,063.25	
Construction of simplified sewer for communities in Basin B	1,356,190.50	1,356,190.50	22.10		
Construction of simplified sewer for communities in Basin C	1,650,705.00				1,650,705.00
Construction of centralised bio-digester sewage treatment plant for Basin A (STP 1)	1,091,125.00				1,091,125.00
Construction of centralised bio-digester sewage treatment plant for Basin B (STP 2)	698,750.00	698,750.00	11.39		
Construction of centralised bio-digester sewage treatment plant fir Basin C (STP 3)	752,500.00			752,500.00	
Construction of a public toilet	72,116.24			36,058.12	36,058.12
Sub-total	**12,763,149**	**5,078,640**	**82.78**	**4,906,621.37**	**2,777,888.12**
2. Drainage and Sullage Improvement					
Construction of soakpits	127,912.55			63,956.28	74,999.09
Construction of 1439m of U600 drain for stormwater conveyance	287,800.00	287,800.00	4.69		
Sub-total	**415,712.55**	**287,800.00**	**4.69**	**63,956.28**	**74,999.09**
3. Solid Waste Management					
Provision of litter bins to households	39,970.00			19,985.00	19,985.00
Construction of 1no. Tool Booth	3,350.00			3,350.00	
Construction of 1no. Solid Waste Holding Bay (SWHB)	14,650.00			14,650.00	
Improvement of graveled access road to site, 260m road length	98,000.00			98,000.00	
Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	155,750.00			155,750.00	
Provide sanitary sites with ancillary facilities (communal containers and refuse holding bays)	97,900.00			97,900.00	
Sub-total	**409,620**	**0**	**0.00**	**389,635.00**	**19,985.00**
4. Water Supply Improvement					
Extension of Distribution pipelines	768,842.82	768,842.82	12.53		
Sub-total	**768,842.82**	**768,842.82**	**12.53**		
Total	14,357,324.36	6,135,282.32	100.00	5,360,212.65	2,872,872.21
Total (with 10% to cater for all contingencies)	**15,793,056.80**				

Table 8.4: Proposed Packaging for Phase 1

Component Description	Phase 1							
	Proposed Infrastructures				Cost (USD)			
	Total	1 Year	2 Years	3 years	Total (USD)	1 Year (2017)	2 Years (2018)	3 years (2019)
1. Excreta Management								
Construction of household toilets								
Construction of VIP Latrines	160	64	48	48	276,633.60	110,653.44	82,990.08	82,990.08
Construction of KVIP Latrines	160	64	48	48	280,800.00	112,320.00	84,240.00	84,240.00
Construction of pour flush with septic tank	90	36	27	27	624,600.00	249,840.00	187,380.00	187,380.00
Construction of water closet with septic tank	115	45	35	35	471,794.40	184,615.20	141,538.32	141,538.32
Construction of pour flush with leach pit	22	9	7	7	74,266.20	29,706.48	22,279.86	22,279.86
Construction of water closet with leach pit	17	7	5	5	130,400.00	52,160.00	39,120.00	39,120.00
Construction of Biofil/Biogas toilet	80	32	24	24	328,204.80	131,281.92	98,461.44	98,461.44
Construction of Enviro loo	70	28	21	21	837,000.00	334,800.00	251,100.00	251,100.00
Construction of sewer and appurtenance	100%	40%	30%	30%	4,118,063.25			
Construction of centralised bio-digester sewage treatment plant	1				1,356,190.50			
Sub-total					**8,497,952.75**	**1,205,377.04**	**907,109.70**	**907,109.70**
2. Water Supply Improvement								
Extension of Distribution pipeline	100%	40%	30%	30%	768,842.82	307,537.13	230,652.85	230,652.85
Sub-total					**768,842.82**	**307,537.13**	**230,652.85**	**230,652.85**
3. Drainage Improvement								
Construction of 1439m of U600 drain for stormwater conveyance	1439m				287,800.00	287,800.00		
Sub-total					**287,800.00**	**287,800.00**		

Table 8.5: Community infrastructure upgrading program summary data and cost

Communities	Area (Ha)	Population	Density Pers/ha	No. of Dwellings	Dwellings per/ha	Average HH/ Dwellings	Average HH Size	Cost/ha (US$)	Cost/Cap (US$)
Ngleshie Amanfro	3,921	25,873	6.6	979	0.25	4.00	5.00	4,027.81	610.41

GAMA/SWP Financed Sub-Projects: as part of the Greater Accra Metropolitan Area Sanitation and Water Project (GAMA/SWP), the project will make provision to cover improvements of excreta management and water supply improvement as well as institutional strengthening, and capacity building over a four year period. However, costs of water connection to houses, construction of soakage pits, household connection to block sewer lines, refuse bins and household toilets shall be fully financed by households. Households that cannot afford the construction of household toilets shall have arrangement with micro-finance to provide facilitation and technical assistance. It is proposed that house owners be given access to G-Fund loans for general home improvements including the provision of household toilets.

The remaining financing packages will be done in the subsequent phases over a six year period.

Human Resources Development: The capacity building team of the project shall be responsible for human resource development. However, the consultant shall provide technical support to the team. The consultant shall be responsible for training of local activists that will promote the various sanitation technology options. Artisans and selected sanitation enterprise-solution providers will be given the opportunity to participate in periodic workshops so that they can share and exchange information on construction of recommended types of household sanitation systems (i.e. WC/pour flush toilets) as well as other systems including single and twin-pit VIP latrines, various eco-san toilets and disposal units. Agents of enterprise-solution providers and trained local activists will inform households of the technical options, be encouraged to upgrade their household facilities, and information provided on use and maintenance of facilities through linkage to Enterprise solution providers.

8.2 Adaptation of WASH Infrastructure Financing Mechanism - G-Fund

People's dialogue has set up G-Fund (a saving scheme) with Ghana Federation of the Urban Poor (GHAFUP). The G-Fund consists of the savings of the urban poor and some contributions received from third parties. The aim of the G-Fund is to provide the urban poor with micro financing for a broad variety of needs selected by the members themselves. Due to the high capital investment costs of WASH facilities as described above, WASH hardware has been the least need selected by members of the federation. Loans have been provided to water vendors, public/private bath houses operators, etc. from the G-Fund. The G-Fund currently amounts GHC 400,000 and the default rates are less than 10%. This level of default is made possible because the G-fund is a community social development fund. Furthermore, GHAFUP employs a system of accounting principle that calculates default only on principal unlike other financial institutions where loans and defaults are calculated on loan plus interest amount.

Members of GHAFUP determine the interest rates, acceptable default rates and recoverable percentages. G-Fund belongs to a global Community of funds operating within the Slum Dweller International (SDI) networks in over 34 countries that focuses not exclusively on financial sustainability but also on delivery of service to beneficiaries with tolerable recovery rates of 70% on the principal component of loans. This implies an extremely low default rate of 10% making it 6% lower than prevailing default rates of microfinance institutions in Ghana.

Members of GHAFUP determine the beneficiaries of loans and hence extremely low default rates (0% to 4%).

This experience by People's Dialogue shall be developed and used in the community. Below is the process involved in obtaining loan from G-Fund to finance WASH needs:

- Expression of interest in WASH facility: interest can be expressed through mobilization by the federation members in the form of advocacy, education and communication backed by the Assembly's policy on sanitation.
- Household is assessed if facility is affordable and data is collected and analysed.
- Loan is processed.
- Proposed site is inspected to determine if technical features such as topography, water table level etc. are favorable.
- The prospective beneficiary pays 10% of the total cost of the project and the savings group he/she belongs to may guarantee for the person.
- The prospective beneficiary then agrees on the loan requested and repayment scenario for the rest of the amount.
- Loan is approved and disbursed to sanitation solution provider.
- The facility is installed and commissioned for use.
- Details of the beneficiary are logged into a database and repayment is monitored by a credit officer.

Figure 8.1 gives the description of the proposed financing mechanisms

From the descriptions above, the following proposals have been made to support the urban poor to construct toilet facilities:

- Collaboration will be made with GHAFUP, Rapid Results Initiative (RRI), artisans and enterprise solution providers to jointly perform community development drive among the community members in order to educate them on sanitation, hygiene and loan repayment.
- Purchase and installation of the water and sanitation facilities will be taken care of by Enterprise Solution providers after certification by People's Dialogue/WasteCare-JV (consultants). The urban poor will be prepared as indirect clients of the WASH business.
- People's Dialogue/WasteCare-JV (consultants) proposes to obtain funds from GAMA SWP through the MAs or directly into its G-Fund to be lent to the urban poor (individually or in groups)

The challenge for meeting the expressed demand by households for improved sanitation facilities are mainly due to lack of means of financing and the issue of tenancy.

The financing challenge can be overcome by providing targeted incentives including granting of loans with very soft conditions such as long repayment period (three to five years), non-commercial interest rates and re-payment scheme designed to meet their income earning patterns.

Table 8.6 illustrates a summary of the cost involved in a public toilet on a daily, weekly, monthly or yearly basis in the community, based on discussion with households, during the baseline survey and WASH inventory. This seeks to determine the cost incurred or involved in using a decent public facility if the household do not have one.

Table 8.6: Cost involved in visiting a public toilet in the community

Facility Type	Average Household Size	Payment per visit (GHS)	Daily Payment (average twice in a day) (GHS)	Weekly Payment (GHS)	Monthly Payment (GHS)	Payment made annually (GHS)
Improved Facility	5	0.30	3.00	21.00	84.00	1,008.00
Unimproved Facility		0.50	5.00	35.00	140.00	1,680.00

The adaptation of the G-Fund model with clearly specified guidelines and rules of engagement for landlords and tenants will fill the financing gap.

The challenge of tenancy and ownership of home toilets is a much difficult one that can be overcome by considering low-cost options that provide individual households exclusive use of toilets they have invested in, such as shared-blocks with specific household allocated privy-rooms or in cases where space is available in outer-rooms (halls) or verandahs.

The ultimate solution is a tenant-friendly toilet with the option of moveable super-structure and fixtures for sitting/squatting connected to a shared primary treatment system e.g. septic-tank with soak pit, biogas digester or simplified sewerage.

There is the need for more focused research and development (R&D) by Enterprise-Solution providers as a means to enhancing business development.

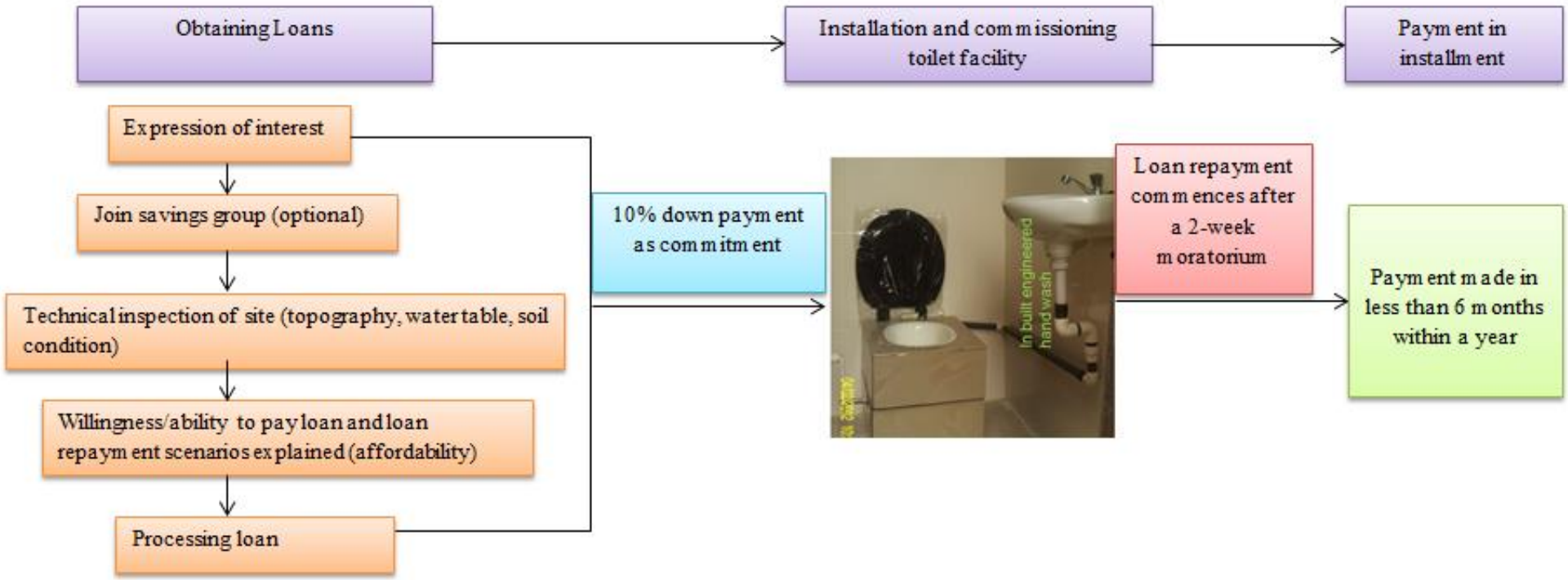


Figure 8.1: Detailed Financing Cost of Project

8.3 Proposed Financing Options

Based on existing financing mechanisms within Ngleshie Amanfro as well as from literature, the following financing options for the household sanitation facilities have been proposed for consideration of the individual households. The options also take into consideration the existing socio-economic conditions in the community.

a. Use Of Own/Family/Friend Income

This is where the family purchases construction materials from the local market using its own income/savings and/or solicits for financial assistance from a family member or friend. Toilets are sometime built using their own labour-in most cases with some help from a local mason. The latter may not necessarily be a skilled toilet mason; but a local person with some construction skills who carries out simple masonry work for a negotiated fee. More complicated toilet types such as cistern/pour flush toilets, biofil, bio-gas/digester toilet, are mostly built by more skilled masons at a fee.

b. Use Of Free Materials and Labour

The simplest way of facilitating the construction process of toilets is to provide information on how to build sanitary toilets with minimal costs, using natural materials. This allows poor households to cover all direct costs for safe, initial excreta containment themselves. Promoting self-built toilets and the self-management of services is the urban variant of Community Led Total Sanitation approach (CLTS).

c. Subsidy (Output Based)

Many programmes of national governments, municipalities and NGOs (such as People's Dialogue) offer subsidies for household toilets construction in Ashaiman for example, and similar subsidies could be targeted for GSMA. The subsidies may come in the form of construction materials, labour, money, O&M services, etc.

d. Loans and Micro Credit

Micro-credit is a very small loan extended by a bank or other financial organisations that provide services to poor households usually without collateral. A Micro Finance Institute (MFI) usually gives loans to households for starting up or improving income-generating activities, not for building toilets.

e. Self Help/Savings Groups

An important problem of poor households is not so much the cost or their willingness to pay, but the need for a sizable upfront lump sum (capital) investment, even for the simplest and most preliminary models. This is further compounded by the difficulty in reserving savings for capital investments. This option involves accessing money from a group savings' scheme to which the household head/member is a contributor. The benefactor should have however contributed some minimum amount or over a period to qualify for the financial assistance. This option of accessing finance is similar to the local 'Susu' scheme. The scheme is often flexible as compared to loans and contributions may be made daily, weekly, fortnightly, and monthly depending on the contributor.

f. Micro Credit With Insurance System

Poor households are often reluctant to take out loans to invest in home toilets if risks of destruction by floods, fire, etc. are high, or if they fear that they may not be able to pay back the loans due reasons of illness or other household crises. Micro-insurance protects low-income people against

financial such problems due to illness, natural disasters, socio-economic crises, etc. Insurance is given in exchange for regular premium payments that are proportional to the subscribers' income and the cost of the risk involved (Churchill, 2006; Evans and Tremolet, 2009). Micro-insurance takes away people's fear for not being able to pay back loans in case of crises. It allows the poor to invest in a healthier living environment, although the effects on improved urban sanitation have yet to be thoroughly investigated. Homeless Peoples Federation (affiliate of Slum Dweller International) and a sister of GHAFUP) are examples of micro-finance institutions that also provide micro insurance on health and housing.

Table 8.7 below gives the advantages and limitations of the financing options above.

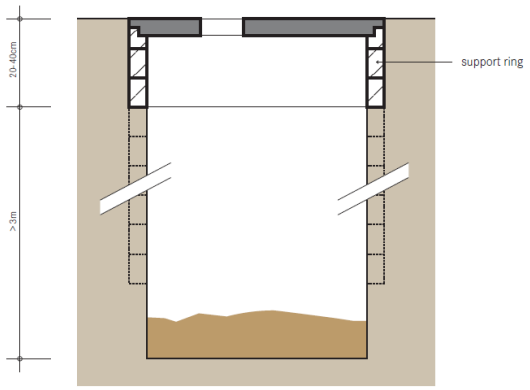
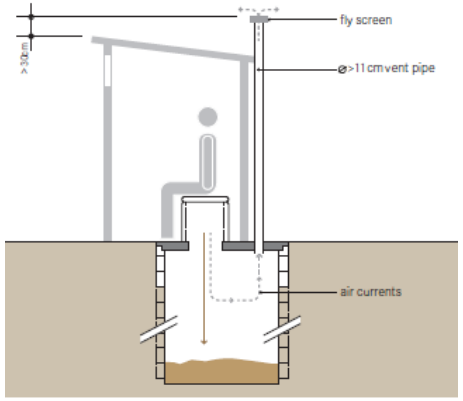
Table 8.7: Advantages and limitations of financing options

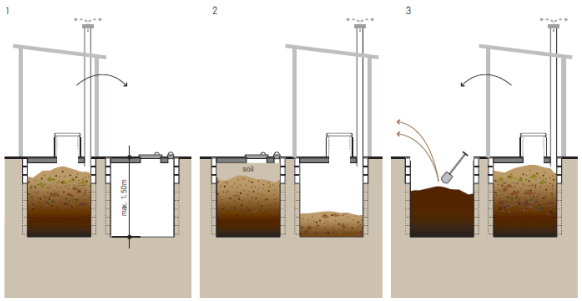
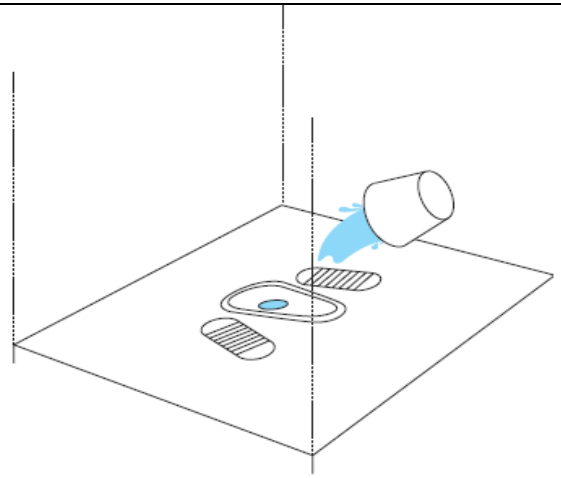
Financing Option	Advantages	Limitations
Use of own/family/friend's income	**Applicability:** Implementation only requires family decision **Sustainability**: It is sustainable so far as the family owns it **Scalability:** Similar to sustainability **Equity:** It is equitable if all family members agree to partake	**Applicability:** saving may take long; inflation over time increases the amounts that must be saved for each member as well **Sustainability:** Family members who are always on the go trekking are likely not to sustain it if they are outside the enclave **Scalability: Similar to Sustainability** **Pro-poor: No absolute basis for measuring this as it is in the hands of the family** **Equity: Some family members are likely not** to contribute
Use of Free Materials And Labour	**Applicability:** Applicable in the entire community if members are educated well on the kind of materials to use for the construction **Sustainability:** Economically sustainable if beneficiaries understand the concept **Scalability:** Scalable as in the case of CLTS **Equity:** Poor communities embrace such concepts because of its workability	**Applicability:** Needs proven that it is able to work **Sustainability:** Not sustainable if materials are not sourced locally **Scalability:** Similar to Sustainability **Pro-poor:** Material cost could escalate and make it not poor-friendly **Equity:** It needs total community participation
Subsidy	**Simplicity:** Allocating subsidies at points of sale has advantages of simplicity because all households receive the same subsidy for the same basic service level **Sustainability:** The programme has led to rapid and sustained increase in coverage with the help of donor funding for market development **Scalability**: Same as above (Sustainability) Pro-poor: The mechanism for ensuring equitable access is simple. Households in locations with the highest poverty levels receive a higher subsidy on the price of materials, while those in locations with a lower poverty level buy materials at less subsidised prices. To ascertain equitable distribution a certain level of uniformity in poverty must exist per location. This implies that it becomes difficult to ensure equity in mixed neighbourhoods where ultra-poor households live amongst less poor households	**Applicability:** Many sanitation programmes with household subsidies are construction - and output driven **Simplicity:** Simplicity depends on the criteria of application. Construction by contractors is quick and easy, but when it is done without user participation in decision making, toilets are most likely left unused or are not used as frequently. Handing out cash subsidies or materials at the onset may result in the use of the subsidy or materials for other purposes. On the other hand, output based aid, which gives subsidies upon evidence of construction (and ideally also use) requires for households to invest upfront, adding costs for assessing performance to the subsidy costs **Sustainability:** Subsidisation is rarely sustainable over long periods of time, and most subsidy schemes are limited in size and duration. Thus, only part of the households may get served, while urban population growth continues to add new unserved households **Scalability:** For reasons of costs, scaling up toilet subsidies to all poor and future poor households is rarely possible. Subsidy schemes typically serve limited numbers of poor urban households **Pro-poor**: Many subsidised sanitation services benefit the better-off or less poor more than the poor and the ultra-poor. Transparency and accountability of subsidies are often low

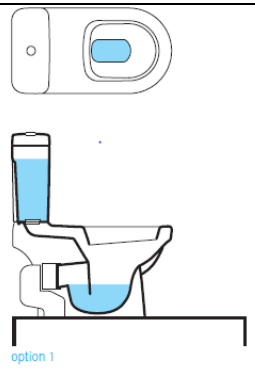
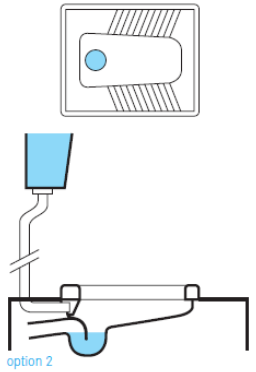
Financing Option	Advantages	Limitations
		Equity: Same as above (Pro-poor)
Loans and Micro Credit	**Applicability:** There is some degree of success because of its commercial nature **Simplicity:** This depends on the rules and regulations of the scheme and the legal freedom facilitating lending to individuals **Sustainability:** They are self-sustaining when they are managed well, when interest rates are flexible to market dynamics, and when there are no economic crises **Pro-poor**: This depends very much on the terms of borrowing and repayment **Equity**: Same as above (Pro-poor)	**Applicability**: Sometimes it is not really tailored. The poor need more than just loans to build a sanitary toilet. From the perspective of a full sanitation life cycle, the costs for upgrade, maintenance, repairs and sanitary emptying must also be understood **Sustainability:** Loan repayments are always a problem. Interest rates must be commercially viable for the loan scheme to be sustainable. However, this will reduce accessibility to the poor. Conversely, subsidised rates make the revolving fund more pro-poor **Pro-poor:** Payment conditions are not adjusted to the situation of the urban poor **Equity:** Poor households often fear to take out private loans because they foresee or fear problems with repayment. Individual households also often do not have the required collateral.
Self Help Groups/Savings Groups	**Applicability**: There is high participation of women in savings and loan clubs. These clubs are often promoted and facilitated by NGOs, such as People's Dialogue on Human Settlements **Simplicity**: The system is easy to understand, implement and replicate **Sustainability:** Savings and loan clubs are sustained by the members themselves and so, depend on the perseverance of their members. Basic accounting and accountability are a must, but can be taught through horizontal learning **Scalability**: The system is easy to understand, implement and replicate **Pro-poor:** The Self Help Groups are especially popular among lower-income women, and match their pattern of small income and expenditure by day **Equity**: In principle, all members have equal rights, but variations do exist	**Applicability:** Challenges to the effectiveness of savings and loan clubs are described by the following: saving may take long; inflation over time increases the amounts that must be saved for each member; members must withstand pressures to use the money for other purposes in times of crisis; and the club may disintegrate before all members have benefited equally, causing tension and conflict **Sustainability:** Learning and sharing across the city requires support from a municipal service, a programme, or an NGO **Scalability**: Gaps in knowledge exist on the city-wide spread and success of the mechanism **Pro-poor**: Ultra-poor women or women from minority groups are sometimes excluded as the organisers tend to invite women like themselves. Membership tends to be based on equal contributions and benefits. Hence, women who are unable to make the same level of contributions opt not to join **Equity**: Male family members may not contribute even if they share in the ultimate benefits of women's participation

9. APPENDICES

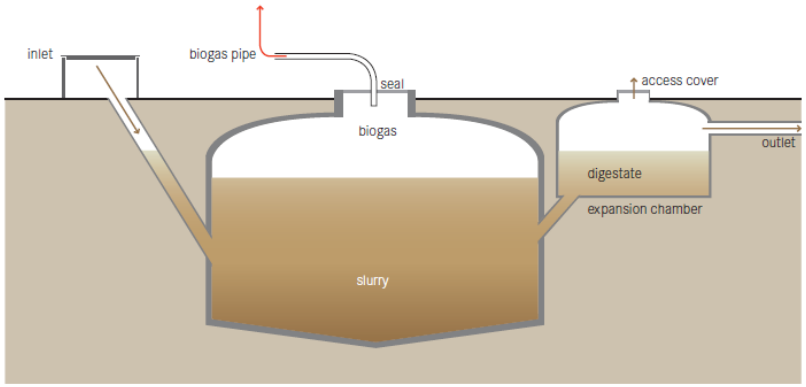
Appendix 1: Description of Sanitation Options

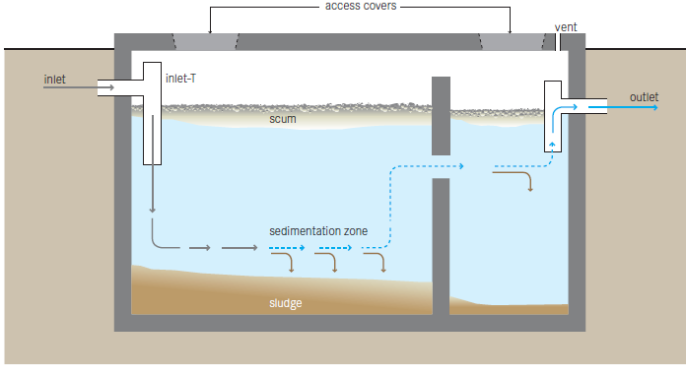
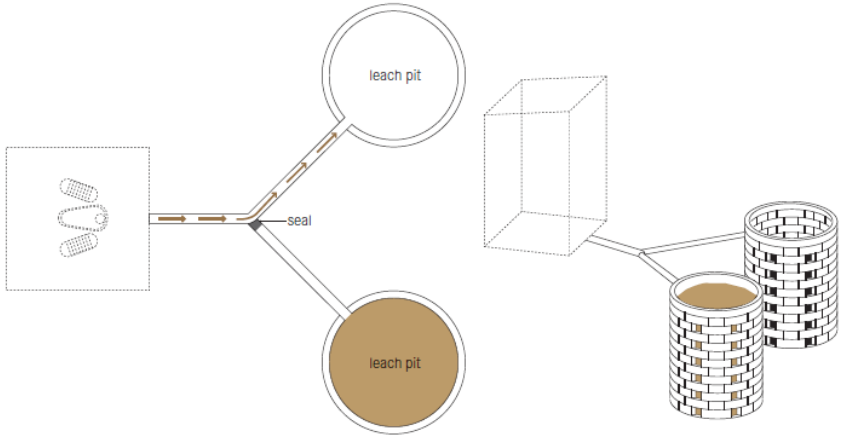
Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Simple Pit Latrine	• Lined/unlined pit • Hygienic cover slab/floor • Super-structure • Seat/squat hole with foot rest • Lid to cover squat hole	• Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials and pit depth • Small land area required • Flies and odours are normally noticeable • Low reduction in BOD and pathogens with possible contamination of groundwater • Costs to empty may be significant compared to capital costs • Sludge requires secondary treatment and/or appropriate	
VIP	• An improved form of pit latrine • Vent pipe with a fly-screen fitted outside the superstructure to trap flies and reduce odour nuisance	• Flies and odour are significantly reduced (compared to non-ventilated pits) • Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials and pit depth • Small land area required • Low reduction in BOD and pathogens with possible contamination of groundwater • Costs to empty may be significant compared to capital costs • Sludge requires secondary treatment and/or appropriate discharge	

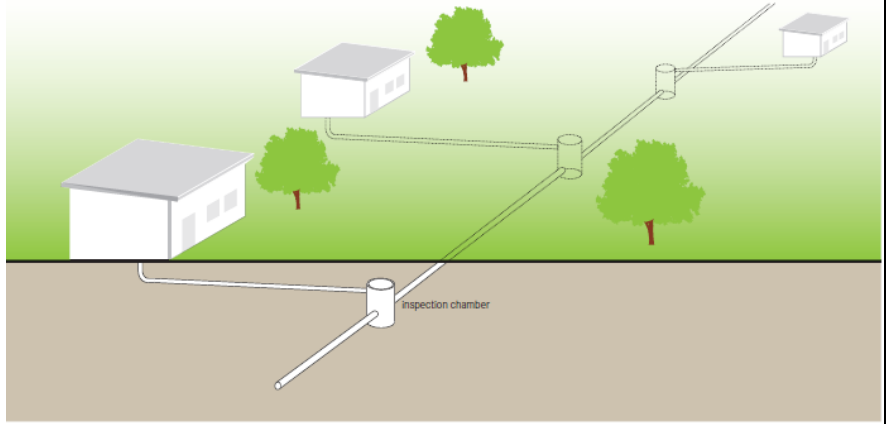
Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
KVIP	• Same design as VIP but has two off-set pits. Use of pit is alternated to allow enough time (gestation period) for the decomposition/treatment of the pit contents into environmentally and healthily safe pit humus.	• Longer life than Single VIP (indefinite if maintained properly) • Excavation of humus is easier than faecal sludge • Significant reduction in pathogens • Potential for use of stored faecal material as soil conditioner • Flies and odours are significantly reduced (compared to non-ventilated pits) • Can be built and repaired with locally available materials • Manual removal of humus is required • Possible contamination of groundwater • Higher capital costs than Single VIP; but reduced operating costs if self-emptied	
Pour Flush	• Pour flush toilets use a pit for excreta disposal and have a special pan which is cast in the floor slab and provides a water seal. • Sometimes a vent pipe with screen is fitted to the pit	• The water seal effectively prevents odours • The excreta of one user are flushed away before the next user arrives • Suitable for all types of users (sitters, squatters, washers, wipers) • Low capital costs; operating costs depend on the price of water • Requires a constant source of water (can be recycled water and/or collected rainwater) • Requires materials and skills for production that are not available everywhere • Coarse dry cleansing materials may clog the water seal	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Water Closet/Cistern flush (connected to septic tank/sewer)	• Similar design feature as pour flush but water stored in the cistern above the toilet bowl and is released by pushing or pulling a lever	• The excreta of one user are flushed away before the next user arrives • No real problems with odours if used correctly • Suitable for all types of users (sitters, squatters, wipers and washers) • High capital costs; operating costs depend on the price of water • Requires a constant source of water • Cannot be built and/or repaired locally with available materials.	 
Urine-Diverting Flush Toilet	• The urine-diverting flush toilet (UDFT) is similar in appearance to a Cistern Flush Toilet except for the diversion in the bowl. • The toilet bowl has two sections so that the urine can be separated from the faeces. • Both sitting and squatting models exist.	• Does not require a constant source of water • No real problems with flies or odours if used and maintained correctly • Can be built and repaired with locally available materials • Low capital and operating costs • Suitable for all types of users (sitters, squatters, washers, wipers) • Prefabricated models not available everywhere • Requires training and acceptance to be used correctly • Is prone to misuse and clogging with faeces • The excreta pile is visible • Men usually require a separate Urinal for optimum collection of urine	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Biofil	• The Biofil system combines the benefits of the WC flush toilet system and those of composting toilets • Flush water is channelled through a biofil digester and liquid waste separated from the solid waste • Liquid waste is purified by organic filtration system channelled into drain field, soak-away or reused • Separated solid/semi-solid waste (human excreta) is decomposed by natural macro and micro-organisms under aerobic conditions into humus	• Easy and convenient to use- like a Cistern Flush Toilet (WC) • No odour • No flies • Privacy • Long life time if well-operated • Eliminates issue of desludging and treatment of faecal sludge common to the septic tank system • Output (decomposed faecal matter) safe to use as humus • Effluent is treated and can be reused for irrigation • Digester requires little space • High capital investment required • Requires a constant source of water • Requires training and acceptance to be used correctly • Skilled personnel needed for maintenance • Requires a vast drain-field where water is not re-used for flushing	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Enviro loo	• The Enviro Loo has a sealed unit that captures and treats waste through the natural processes of dehydration and evaporation	• No water is required for its operations • Odourless and fly control • Permanent installation, no relocation • Output (decomposed matter in sealed unit) environmentally safe • Privacy • Can be in-built (within house) • Simple technology-easy to manage • Limited availability; cannot be built or repaired locally • Requires training and acceptance to be used correctly • Expensive (capital cost) compared to Arborloo • Associated maintenance and servicing cost	 The new Eloo C-60
Toilet facilities connected to Biogas Reactor	A biogas reactor is an airtight chamber that facilitates the anaerobic degradation of blackwater, sludge, and/or biodegradable waste. It also facilitates the collection of the biogas produced in the fermentation processes in the reactor. The gas forms in the slurry and collects at the top of the chamber, mixing the slurry as it rises. The digestate is rich in organics and nutrients, almost odourless and pathogens are partly inactivated.	• Generation of renewable energy • Small land area required (most of the structure can be built underground) • No electrical energy required • Conservation of nutrients • Long service life • Low operating costs • Requires expert design and skilled construction • Incomplete pathogen removal, the digestate might require further treatment • Limited gas production below 15 °C	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Toilet facilities connected to Septic tank	A septic tank is a watertight chamber made of concrete, fibreglass, PVC or plastic, through which blackwater and greywater flows for primary treatment. Settling and anaerobic processes reduce solids and organics, but the treatment is only moderate.	• Simple and robust technology • No electrical energy is required • Low operating costs • Long service life • Small land area required (can be built underground) • Low reduction in pathogens, solids and organics • Regular desludging must be ensured • Effluent and sludge require further treatment and/or appropriate discharge	
Toilet facilities connected to leach pits	This technology consists of two alternating pits connected to a Pour Flush Toilet. The blackwater (and in some cases greywater) is collected in the pits and allowed to slowly infiltrate into the surrounding soil. Over time, the solids are sufficiently dewatered and can be manually removed with a shovel.	• Because double pits are used alternately, their life is virtually unlimited • Excavation of humus is easier than faecal sludge • Significant reduction in pathogens • Potential for use of stored faecal material as soil conditioner • Flies and odours are significantly reduced (compared to pits without a water seal) • Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials; no or low operating costs if self-emptied • Small land area required • Manual removal of humus is required • Clogging is frequent when bulky cleansing materials are used • Higher risk of groundwater contamination due to more leachate than with waterless systems	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Simplified sewer system	A simplified sewer describes a sewerage network that is constructed using smaller diameter pipes laid at a shallower depth and at a flatter gradient. The simplified sewer allows for a more flexible design at lower costs.	• Can be laid at a shallower depth and flatter gradient than Conventional Sewers • Lower capital costs than Conventional Sewers; low operating costs • Can be extended as a community grows • Greywater can be managed concurrently • Does not require onsite primary treatment units • Requires repairs and removals of blockages more frequently than a Conventional Gravity Sewer • Requires expert design and construction • Leakages pose a risk of wastewater exfiltration and groundwater infiltration and are difficult to identify	

Appendix 2: Knowledge of Community Members on Proposed Household Sanitation Technology Options

Category 1: Sanitation technology options targeting specific households			
Household Sanitation Technology Type		No. of discussants with knowledge and acceptance of the facility type	Percentage of discussants with knowledge and acceptance of the facility type
Total No. of Community Representatives			40
1	Simple pit latrine	40	100.00%
2	VIP	40	100.00%
3	KVIP	40	100.00%
4	Pour flush with septic tank	40	100.00%
5	Pour flush with leach pit	0	0.00%
6	WC/cistern flush with septic tank (single/double)	40	100.00%
7	WC/cistern flush with leach pit (single/double)	0	0.00%
8	Urine diversion flush toilet (UDFT) with ash flush	0	0.00%
9	Biofil toilet	15	37.50%
10	Biogas toilet	10	25.00%
11	Enviro loo/Ecosan waterless toilet	10	25.00%
Category 2: Household shared sanitation technology options			
1	Shared block VIP	0	0.00%
2	Shared block KVIP	0	0.00%
3	Shared block pour flush with shared septic tank	0	0.00%
4	Shared block WC with shared septic tank	0	0.00%
5	Shared block Urine Diversion Flush Toilet (UDFT) with ash flush	0	0.00%
6	Shared block biofil toilet	0	0.00%
7	Biogas toilet with shared digester (in house)	0	0.00%
8	Shared block enviro loo/Ecosan waterless toilet	0	0.00%
Category 3: Communal based/network sanitation technology options			
1	Pour flush with centralized septic tank	0	0.00%
2	WC/cistern flush with centralized septic tank	0	0.00%
3	Biogas toilet with centralized/communal digester	0	0.00%

Appendix 3: Cost estimates of proposed household sanitation options (Shared-block)

Toilet Code	Type of Sanitation Technology Option	Unit	Quantity	Unit Cost (US$)	Amount (US$)
VIP, (CSD/H-01)	2-vaults VIP Latrine	No.	32	864.48	27,663.36
VIP, (CSD/H-02)	3-vaults VIP Latrine	No.	32	1,296.72	41,495.04
VIP, (CSD/H-03)	4-vaults VIP Latrine	No.	32	1,728.96	55,326.72
VIP, (CSD/H-04)	5-vaults VIP Latrine	No.	32	2,161.20	69,158.40
VIP, (CSD/H-05)	6-vaults VIP Latrine	No.	32	2,593.44	82,990.08
Subtotal Households In-House VIP Toilets			**160**		**276,633.60**
KVIP, (CSD/H-01)	2-privy room KVIP toilet	No.	32	877.50	28,080.00
KVIP, (CSD/H-02)	3-privy room KVIP toilet	No.	32	1,316.25	42,120.00
KVIP, (CSD/H-03)	4-privy room KVIP toilet	No.	32	1,755.00	56,160.00
KVIP, (CSD/H-04)	5-privy room KVIP toilet	No.	32	2,193.75	70,200.00
KVIP, (CSD/H-05)	6-privy room KVIP toilet	No.	32	2,632.50	84,240.00
Subtotal Households In-House KVIP Toilets			**160**		**280,800.00**
PFST, (CSD/H-01)	2-privy room pour flush with septic tank	No.	18	3,450.00	62,100.00
PFST, (CSD/H-02)	3-privy room pour flush with septic tank	No.	18	5,200.00	93,600.00
PFST, (CSD/H-03)	4-privy room pour flush with septic tank	No.	18	6,950.00	125,100.00
PFST, (CSD/H-04)	5-privy room pour flush with septic tank	No.	18	8,700.00	156,600.00
PFST, (CSD/H-05)	6-privy room pour flush with septic tank	No.	18	10,400.00	187,200.00
Subtotal Households Pour Flush Toilets with Septic Tanks			**90**		**624,600.00**
WCST,(CSD/H-01)	2-privy room water closet with septic tank	No.	23	2,051.28	47,179.44
WCST, (CSD/H-02)	3-privy room water closet with septic tank	No.	23	3,076.92	70,769.16
WCST, (CSD/H-03)	4-privy room water closet with septic tank	No.	23	4,102.56	94,358.88
WCST, (CSD/H-04)	5-privy room water closet with septic tank	No.	23	5,128.20	117,948.60
WCST, (CSD/H-05)	6-privy room water closet with septic tank	No.	23	6,153.84	141,538.32
Subtotal Households WC Toilets with Septic Tanks			**115**		**471,794.40**
PFLP, (CSD/H-01)	2-privy room pour flush with leachate pit	No.	5	1,747.44	8,737.20
PFLP, (CSD/H-02)	3-privy room pour flush with leachate pit	No.	5	2,621.16	13,105.80

PFLP, (CSD/H-03)	4-privy room pour flush with leachate pit	No.	4	3,494.88	13,979.52
PFLP, (CSD/H-04)	5-privy room pour flush with leachate pit	No.	4	4,368.60	17,474.40
PFLP, (CSD/H-05)	6-privy room pour flush with leachate pit	No.	4	5,242.32	20,969.28
Subtotal Households Pour Flush Toilets with Leachate Pits			**22**		**74,266.20**
WCLP, (CSD/H-01)	2-privy room water closet-leachate pit	No.	5	3,100.00	15,500.00
WCLP, (CSD/H-02)	3-privy room water closet-leachate pit	No.	5	4,600.00	23,000.00
WCLP, (CSD/H-03)	4-privy room water closet-leachate pit	No.	4	6,125.00	24,500.00
WCLP, (CSD/H-04)	5-privy room water closet-leachate pit	No.	4	7,650.00	30,600.00
WCLP, (CSD/H-05)	6-privy room water closet-leachate pit	No.	4	9,200.00	36,800.00
Subtotal Households WC Toilets with Leachate Pits			**22**		**130,400.00**
Toilet Code	**Type of Sanitation Technology/ Option**	**Unit**	**Quantity**	**Unit Cost (US$)**	**Amount (US$)**
BFG, (CSD/H-01)	2-privy room Biofil/Biogas toilet	No.	16	2,051.28	32,820.48
BFG, (CSD/H-02)	3-privy room Biofil/Biogas toilet	No.	16	3,076.92	49,230.72
BFG, (CSD/H-03)	4-privy room Biofil/Biogas toilet	No.	16	4,102.56	65,640.96
BFG, (CSD/H-04)	5-privy room Biofil/Biogas toilet	No.	16	5,128.20	82,051.20
BFG, (CSD/H-05)	6-privy room Biofil/Biogas toilet	No.	16	6,153.84	98,461.44
Subtotal Households Biofil/Biogas toilet			**80**		**328,204.80**
EVL, (CSD/H-01)	2-privy room Enviro-Loo Toilet	No.	14	8,500.00	102,000.00
EVL, (CSD/H-02)	3-privy room Enviro-Loo Toilet	No.	14	11,500.00	138,000.00
EVL, (CSD/H-03)	4-privy room Enviro-Loo Toilet	No.	14	13,900.00	166,800.00
EVL, (CSD/H-04)	5-privy room Enviro-Loo Toilet	No.	14	16,550.00	198,600.00
EVL, (CSD/H-05)	6-privy Enviro-Loo Toilet	No.	14	19,300.00	231,600.00
Subtotal Households Enviro-loo Toilets			**70**		**837,000.00**
Total Cost of Households Sanitation Subproject			**748**		**3,023,699.00**

Appendix 4A: Summary of technical and financial options for Ngleshie Amanfro (Option 1)

S/No.	Project Intervention (GSMA)	Amount in US$
1	Promotion of household toilets	3,023,699.00
2	Construction of 2No. 24-seater pour flush public toilets at the Galilea and Manheami	72,116.24
3	Construction of sewer and appurtenance	7,124,958.75
4	Construction of centralised bio-digester sewage treatment plant	2,542,375.00
5	Extension of GWCL water supply distribution mains	768,842.82
6	Provision of standard 240L household waste storage bins	39,970.00
7	Provision of solid waste holding bay at Galilea market	369,650.00
8	Construction of household soakage pits	127,912.55
9	Construction of 1,439m of U600 drain for storm water conveyance	287,800.00
10	Sub-total	14,357,324.36
11	Add 10% of Subtotal as contingency	1,435,732.44
12	**Total Cost of Interventions (Option 1)**	**15,793,056.80**

Appendix 4B: Summary of technical and financial options for Ngleshie Amanfro (Option 2)

S/No.	Project Intervention (GSMA)	Amount in US$
1	Promotion of household toilets	3,023,699.00
2	Construction of 2No. 20-seater WC flush public toilets at the Galilea and Manheami	90,145.30
3	Construction of sewer and appurtenance	7,124,958.75
4	Construction of centralised bio-digester sewage treatment plant	2,542,375.00
5	Extension of GWCL water supply distribution mains	768,842.82
6	Provision of standard 240L household waste storage bins	39,970.00
7	Provision of solid waste holding bay at Galilea market	369,650.00
8	Construction of household soakage pits	127,912.55
9	Construction of 1,439m of U600 drain for storm water conveyance	287,800.00
10	Sub-total	14,375,353.42
11	Add 10% of Subtotal as contingency	1,437,535.34
12	**Total Cost of Interventions (Option 2)**	**15,812,888.76**

Appendix 5: Preliminary Design Report for Ngleshie Amanfro Simplified Sewerage

Appendix 6: Draft Tender Documents for Water Supply Extension Works in Ngleshie Amanfro

Appendix 7: Photo shots from the Stakeholders Negotiation Meeting on Proposed WASH Infrastructure and Service Options

Cross section of participants at negotiation meetings

GAMA SWP Project Coordinator for GSMA addressing participants

Presentation on proposed options by Consultant

Participant contributing to discussions on proposed options

Outgoing GAMA SWP Coordinator addressing comments raised by participants

Presentations by local sanitation enterprise solution providers

Presentations by Microfinance institutions (HFC Boafo and Peoples' Dialogue G-Fund)